FEBRUARY
1960

FOUNDRY

A PENTON PUBLICATION

Unconventional Diecasting Production

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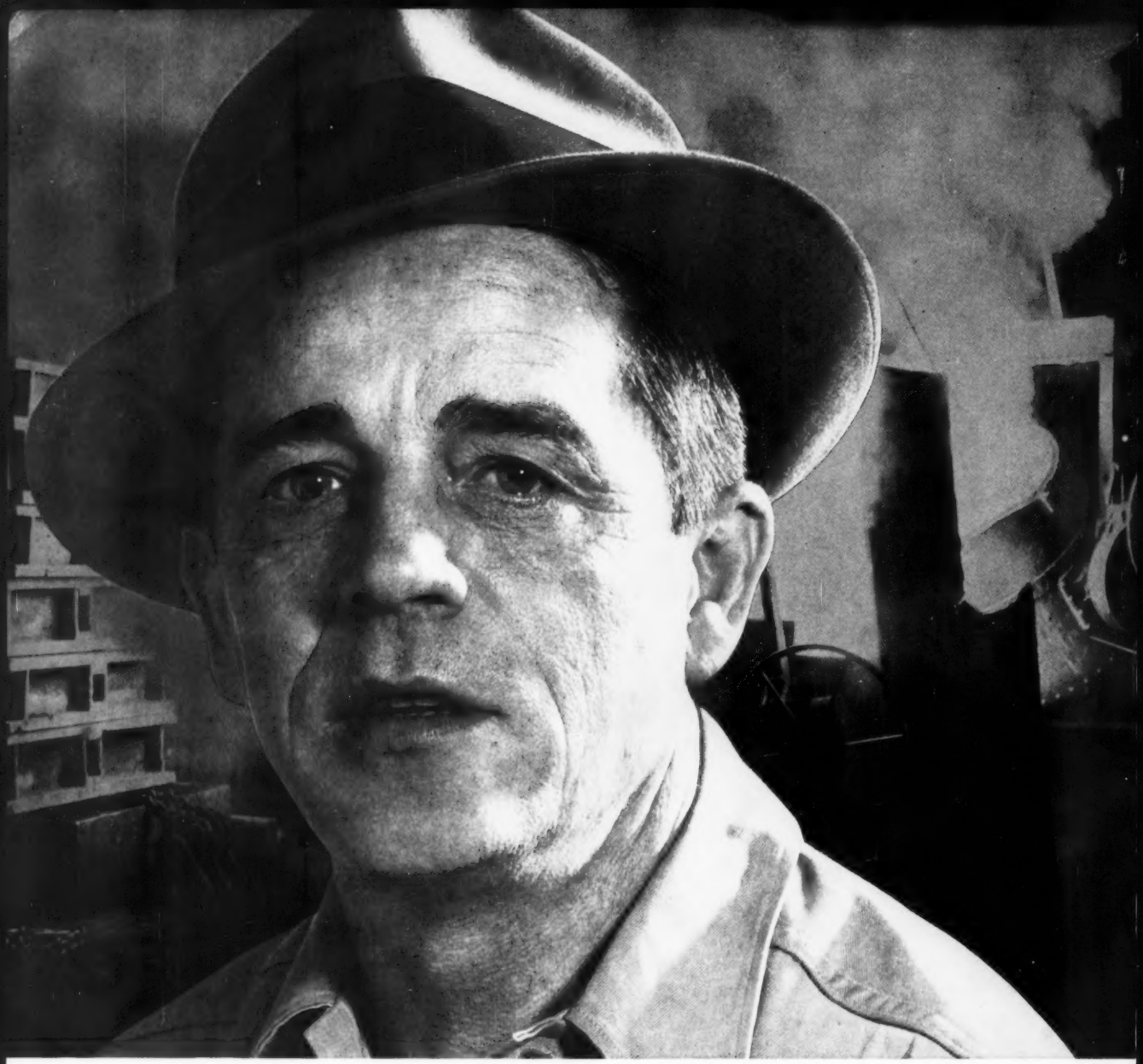

"It's the lowest cost alloy for ductile iron"

Foundries find that ELECTROMET magnesium-ferrosilicon is an economical, convenient source of magnesium for ductile iron. When added to a suitable composition, the alloy gives maximum ductility by promoting a matrix of soft ferrite. By adjusting the analysis, it can easily be used in high-strength irons having somewhat lower ductility.

Magnesium-ferrosilicon is available in grades with or without cerium. Cerium (0.5 or 2%) helps control unwanted residual elements which hinder the formation of spheroidal graphite. For further information and technical assistance, contact your UNION CARBIDE METALS representative.

UNION CARBIDE METALS COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y.

Write for the folder, "Magnesium-Ferrosilicon for Ductile Iron."

UNION CARBIDE METALS

***Electromet** Brand Ferroalloys and other Metallurgical Products*

The terms "Electromet" and "Union Carbide" are registered trade-marks of Union Carbide Corporation.

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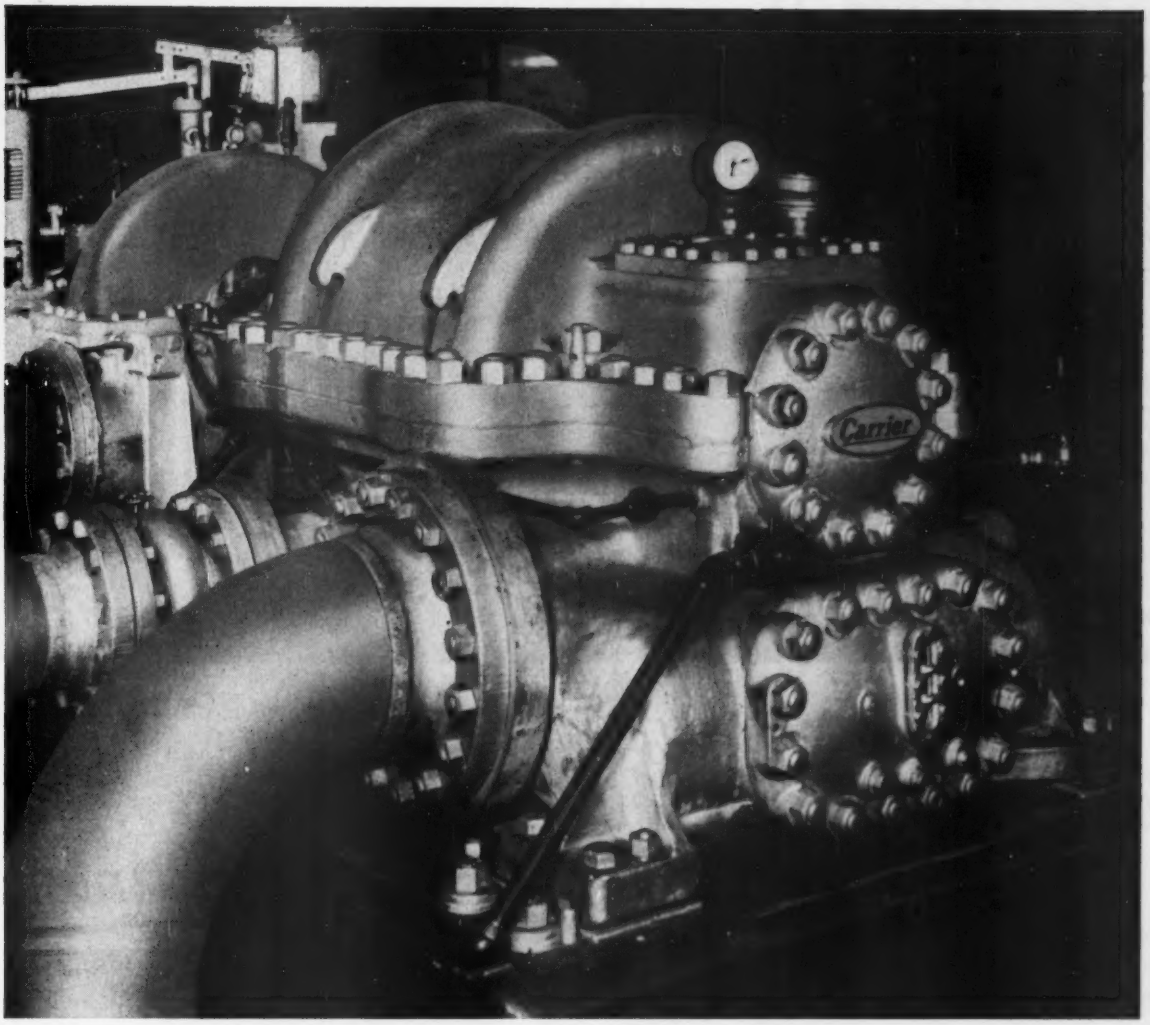


4½% Nickel plus good casting makes these casings strong and tough at–185°F

Here's how the foundry solved a low temperature problem:

This Carrier #350 Compressor is designed for producing ethylene by low temperature (–185°F) high pressure (600 psi) fractionation.

Under these conditions ordinary cast steel is brittle and could easily fracture. Could the foundry turn out castings which would have high strength and toughness at the low temperatures involved?

They could . . . this way:

They made these three-ton compressor housing castings from 4½% nickel alloy steel; normalized and water quenched them, and finally tempered them. Under this treatment the castings easily exceed these minimum mechanical properties:

Ultimate tensile strength	70,000 psi
Yield strength	40,000 psi
Elongation in 2"	22%
Reduction of area	30%
Charpy keyhole impact (@ –185°F)	15 ft. lb.

Nickel does wonders for cast irons and steels destined for severe service . . . aids development of desired metal structure.

Recommend Nickel Alloys Freely

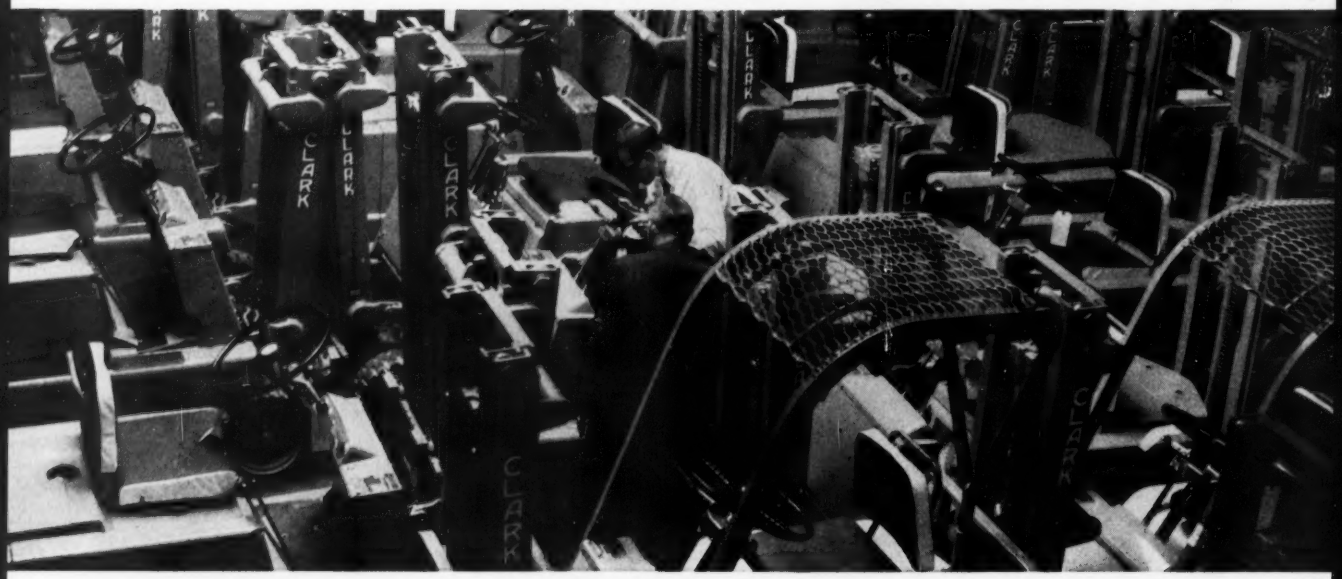
Nickel is a plentiful and versatile material and you can count on Inco Nickel's Development and Research Division for information to help you in selecting specific materials to use in particular applications.

The INTERNATIONAL NICKEL COMPANY, Inc.
67 Wall Street New York 5, N. Y.

INCO NICKEL

NICKEL ALLOYS PERFORM BETTER LONGER

NOW! A full service rental program



that saves capital, eliminates maintenance problems... rids you of truck downtime!

A new, *flexible* rental system, enabling you to acquire all of your materials handling equipment, with full service arrangements, and *complete maintenance coverage*, is now available.

You save working capital! Without large outlays of capital you take immediate possession of all new materials handling equipment. Your present equipment is purchased at full cash value . . . your only actual capital expenditure is one budgeted monthly payment.

Downtime is eliminated! The Clark Rental System maintains a standby fleet of equipment for your immediate use when an emergency arises. The possibility of delays and losses to downtime are practically eliminated.

No more maintenance! Renting takes you out of the repair business. You no longer need to maintain a special repair shop, an inventory of parts, or special tools and equipment.

You rid yourself of hidden costs! The burden on your cost accounting system is reduced to the bone. Clerical time, rising costs of inflation, and the high cost of using obsolete equipment . . . are all eliminated. One cost is your only cost.

A tailored system! A rental contract is prepared only after a thorough study of your specific operation is made. The flexibility of the Clark Rental System provides you with a *basic* program—without frills or extras—which keeps your handling costs to a minimum.

Compare the advantages for yourself! A booklet describing the rental program in detail, including a cost comparison chart, is available without obligation. For your personal copy, write or wire to the address below.

CLARK
RENTAL SYSTEM

CLARK RENTAL CORPORATION
485 Lexington Avenue • New York 16, N. Y.

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February 1960
Volume 88—Number 2

FOUNDRY
A PENTON PUBLICATION

Foundry coke rarely is shipped as carefully as it was here. Packaged in moistureproof bags and crated, 2 tons of coke produced by Eastern Gas & Fuel Associates are shown being loaded by the Navy for delivery to a foundry of the latter in the Antarctic.

More Inflation 75
Editorial—By FRANK G. STEINEBACH

Uranium Foundry Practice 76
In addition to its fission-sustaining characteristics, uranium is a uniquely high-strength, high-density material. Cast uranium parts may be used in nuclear-powered space ships—By G. D. CHANDLEY and D. G. FLACK

Mold and Core Inspection Can Cut Costs . . . 80
Higher quality castings begin with mold and core inspection. Ohio Steel Foundry Co., Springfield, Ohio, reduced cleaning costs from 33 to 20 per cent of total shop costs through such inspection—By JOSEPH GILLESPIE

An Unconventional Approach to Diecasting . 84
Zinc and aluminum diecastings are produced in a wide range of sizes on 400 and 600-ton machines. Unusual features include extensive use of unit dies, continuous melting, and conveyorized handling—By JACK C. MISKE

Practical Tips on Cupola Control 88
Attention to fundamentals provides a predictable, consistent volume of iron, metal at the proper temperature for the castings poured, and controlled composition to give satisfactory properties—By SAM F. CARTER

What To Consider in Shell Core Production . . 96
The author discusses the relationship of the resin binder used in the shell process to types of shell cores, mix formulation, corebox design, shell core machines, and casting defects—By R. S. L. ANDREWS

Gating of Ductile Iron 101
This article, fifth in our gating and risering series, discusses gating to produce quality ductile iron castings and explains some of the fundamental characteristics of ductile iron—By R. W. WHITE

Gas Firing Cuts Foundry Costs 128
Gas-fired melting of metal for ductile iron castings has lowered costs and increased production at Ductile Iron Foundry Co.—By STEPHEN J. MICHAELS

AFS Exposition Will Show New Products . . . 143
Many new products will be shown at the 1960 AFS Castings Congress and Exposition. Nearly 85 per cent of the space already has been taken

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It's how tools are used that counts, and it's amazing how results vary with the same tools used by different persons—By RALPH L. LEE

Customizing a New Locker Installation 170

Advantages of customized locker installations include improved sanitation, ventilation, employee morale, and property protection—By C. D. CANNON

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Cameron Iron Works Inc., Houston, produces press dies varying in weight from 8000 to 40,000 lb net—By HARRY YOUNG

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FOUNDRY is edited primarily for management, production, technical, and purchasing personnel in foundries. A copy is sent at no cost to each metal casting plant in the U. S. and Canada employing 20 or more workers and to selected smaller foundries. Additional copies are sent to each foundry to the extent necessary to serve all key foundry personnel on a personal or routed basis. A limited number of copies is supplied at no cost to educational institutions. Subscriptions in the U. S., possessions, and Canada for home-addressed copies and copies not qualified for under the above principles: One year, $10. Single copy, $1. Other countries: One year, $20. Single copy, $2. Published monthly and copyright 1960 by The Penton Publishing Co., Penton Building, Cleveland 13, Ohio. Accepted as controlled circulation publication at Cleveland, Ohio.

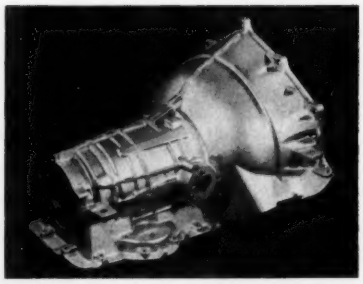
THE EDITORS' WORKSHOP

SODIUM SILICATE: An effective method of improving the surface finish of gray iron castings has been developed by the C. Lee Cook Co., Louisville, Ky. Essential features are

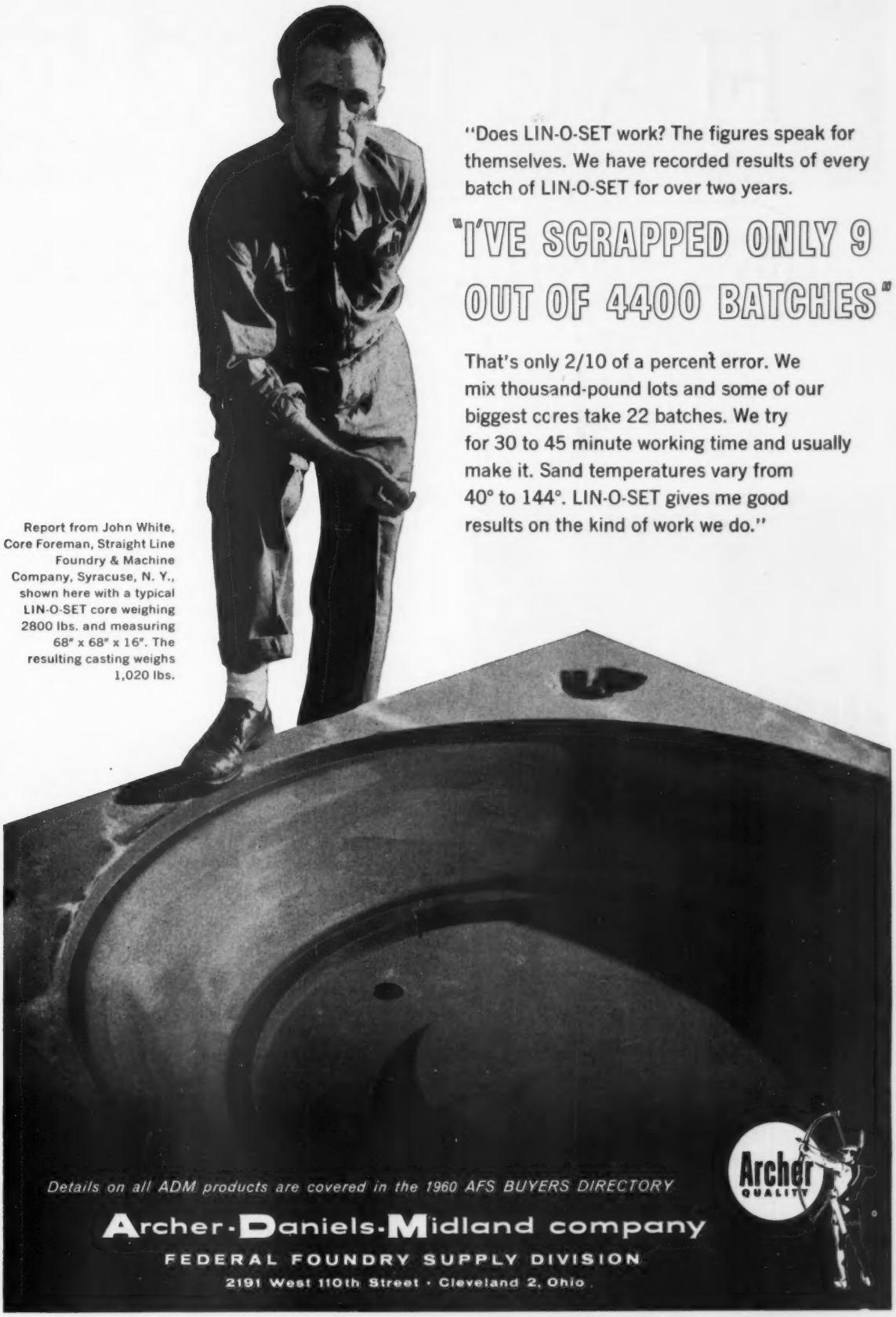
use of a facing composed of a relatively fine sand plus sodium-silicate binder. No gassing is employed, curing being accomplished by air setting and the advance heat from molten metal entering the mold. Details will be presented next month.

STEEL MELTING: Recent advances in steel melting practices at the Watertown Arsenal have produced significant improvement in the ductility and toughness of cast low-alloy steels while maintaining constant strength. John Zotos of the Arsenal's Rodman Laboratory will discuss these developments in the March issue.

ALUMINUM: The extent to which additional applications of aluminum castings will be made by the automotive industry depends on whether certain technical problems can be



solved, according to R. F. Thomson of General Motors Research Laboratories. These problems, related principally to production of die and semipermanent mold castings, will be outlined by him in a coming article.



"Does LIN-O-SET work? The figures speak for themselves. We have recorded results of every batch of LIN-O-SET for over two years.

"I'VE SCRAPPED ONLY 9 OUT OF 4400 BATCHES"

That's only 2/10 of a percent error. We mix thousand-pound lots and some of our biggest cores take 22 batches. We try for 30 to 45 minute working time and usually make it. Sand temperatures vary from 40° to 144°. LIN-O-SET gives me good results on the kind of work we do."

Report from John White, Core Foreman, Straight Line Foundry & Machine Company, Syracuse, N. Y., shown here with a typical LIN-O-SET core weighing 2800 lbs. and measuring 68" x 68" x 16". The resulting casting weighs 1,020 lbs.

Details on all ADM products are covered in the 1960 AFS BUYERS DIRECTORY

Archer-Daniels-Midland company

FEDERAL FOUNDRY SUPPLY DIVISION

2191 West 110th Street · Cleveland 2, Ohio

Archer QUALITY

Circle 555 on Page 53

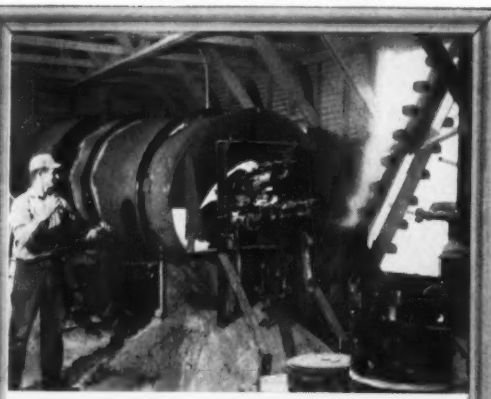
HAULS OF

HERE are three examples of United States Rubber Conveyor Belt performance, taken from records in the foundry industry.

These belts are just some of the "U.S." stand-outs which demonstrate, year after year, why "U.S." is the world's largest producer of conveyor belts.

For steady, day-in-and-day-out dependability in conveyor belting, it always pays you to secure the advantages of "U.S." Engineering. "U.S." Engineers work directly with "U.S." Distributors or original equipment manufacturers to assure their obtaining the right belt recommendations for each type of conveying.

The most comprehensive belting engineering information in the industry is available through your "U.S." Distributor. It will pay you to check with him.



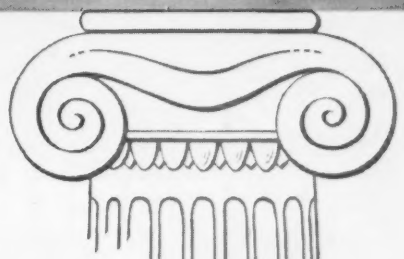
"This U.S. Rubber Belt has been on the job 3 times longer than any belt previously used," says co-owner J. C. Barry of Barry Sand Co. (Silsbee, Texas), producers of foundry, chemical and specialized sands. "We have two U.S. Rubber elevator belts here. We need belts that will last a long time under terrific heat (up to 450 degrees F.) and terrific weight, plus the abrasive action of sand. So far, each of these belts has outlasted the belts of other makes while showing no signs of wear. *These belts never fail us... no lost production, no downtime.* We are very satisfied. They do our job best."

Turn on the Heat
— this Belt can take it!

Until now, hot materials belts suffered from many different shortcomings. Splices would fail prematurely; abrasion resistance and heat aging would be greatly accelerated as temperatures rose; the carcass of glass fabric belts required special treatments to improve adhesion (and these special treatments themselves would break down).

But now, all these unsatisfactory qualities have been eliminated by U.S. Rubber's premium belt for hot service, Type HTB Glass Fabric Belt. Thoroughly tested on the toughest kinds of hot materials jobs, U.S. Type HTB has given maximum performance under maximum operating temperatures.

FAME



COMPARE THESE ADVANTAGES

- Heat-resistant cover of specially compounded high-temperature Butyl rubber to withstand excessive heat.
- *Exclusive* all-glass carcass, woven to be self-cushioning and to prevent internal abrasion . . . eliminates premature char-out . . . maintains full strength throughout the longer life of the belt . . . gives life-of-the-belt adhesion without special treatment . . . provides superior flex life, fastener-holding strength and heat aging.
- Thinner belt for better heat dissipation, because bulky asbestos and duck plies have been eliminated.
- New high-temperature Butyl cover and all-glass fabric carcass combine to provide perfectly balanced belt of unexcelled heat resistance.
- Belt can be engineered to specific conditions of heat, abrasion and operating tensions.
- Lower cost-per-ton because of competitive price and longer belt life.

Tramp Iron can't go on a TEAR on this belt!

Hot foundry sand loaded with jagged pieces of tramp iron is a murderous combination for a conveyor belt.

That's why foundries use U.S. FoundryGiant *RipStop* Conveyor Belts. These special heat-resistant belts have rip-stopping wire ribs imbedded in the carcass across the belt at 3' intervals to prevent the jagged pieces of metal flash, sprues, gates, geigers, etc., from going on a tear and wrecking the belt. "U.S." belts are lasting 8 times longer than other belts in many foundries. Photo shows belt in a leading Southern foundry.

Mechanical Goods Division

United States Rubber

WORLD'S LARGEST MANUFACTURER OF INDUSTRIAL RUBBER PRODUCTS

Rockefeller Center, New York 20, N.Y. In Canada: Dominion Rubber Company, Ltd.

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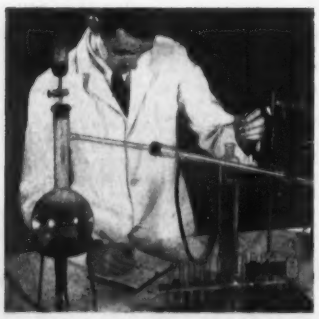
UNIFORM

Size Strength Structure and Chemical Analysis

KOPPERS *Premium Foundry Coke*



WE CHECK EACH DAY'S RUN to make certain you get foundry coke of the exact size and chemistry that is most efficient for the job. Analyses are available to your foundry on request.

Uniformity! That's what Koppers guarantees and delivers day-after-day in car-after-car of Koppers Premium Foundry Coke. Prepared from top-quality West Virginia coals, Koppers Premium Foundry Coke comes to you absolutely uniform in *size, strength, structure* and *chemical analysis.* Because of its superior physical qualities, high carbon, and low ash, Koppers Coke enables the foundryman to maintain higher temperatures which increases the cleanliness of the iron, helps reduce fuel consumption and leads to lower operating costs. Make your next order Koppers Premium Foundry Coke. It is available anywhere in the U. S. or Canada in sizes to fit your needs. Koppers Company, Inc., Pittsburgh, Pa.

"This H-25 PAYLOADER® eliminated the need for costly plant revisions"*

*Says Robert Knight, Foundry Superintendent of Sumner Iron Works, Everett, Washington: *"We had reached a point in our operation where greater plant efficiency and productivity were necessary — either through plant revisions or improved materials handling. We tried an H-25 'PAYLOADER' and it gave us the productivity and economies desired without installing conveyors and other costly materials handling equipment."*

Sumner Iron Works has expanded rapidly through the years, taxing its foundry facilities considerably. Finally it reached a point where increased foundry productivity was absolutely essential and material handling improvements were required. Before taking this costly step, it was decided to see what a "PAYLOADER" could do to step up production within existing facilities.

The H-25 "PAYLOADER" was placed in service, bringing in sand from storage bins, filling the mixer hopper, and also dumping sand directly into the molds. Formerly this was a slow, laborious wheelbarrow and shovel job with long man-hour requirements. Now the "PAYLOADER" will pay for itself very quickly in savings alone — it has increased foundry production and has eliminated the requirements for other changes.

Whatever your material handling problem may be, there is a proper size "PAYLOADER" to do the job most efficiently.

HOUGH®

THE FRANK G. HOUGH CO.
LIBERTYVILLE, ILLINOIS
SUBSIDIARY — INTERNATIONAL HARVESTER COMPANY

THE FRANK G. HOUGH CO. 2-A-3
703 Sunnyside Ave., Libertyville, Ill.

Send data on all "PAYLOADER" models and attachments.

Name _____

Title _____

Company _____

Street _____

City _____ State _____

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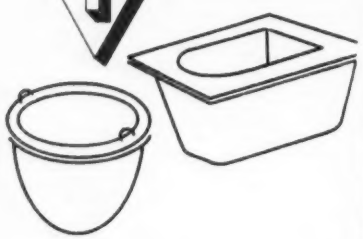
TIFFIN QUALITY

"Mark of Quality"



MELTING POTS

There is

A TIFFIN FOUNDRY Quality Melting Pot for all Non-ferrous Metal.

- IMMEDIATE DELIVERY on all standard size melting pots from stock.
- LONGER LIFE—The iron used in our melting pots is especially engineered for its heat and erosion resisting qualities. This means longer pot life.
- REAL ECONOMY—Pound for pound of melted metal, it costs less when you use Tiffin Foundry Quality Pots.
- SPECIAL POTS available. Send us your specifications.
- OVER 50 YEARS EXPERIENCE in the manufacture of quality pots and die equipment.

SPECIFY the pot with the trademark of quality—they are engineered to last.

DIES, PLUNGERS, NOZZLES & BAR STOCK ALSO AVAILABLE

Write today for complete information.

THE TIFFIN FOUNDRY, INC.
TIFFIN, OHIO

Circle 559 on Page 53

With the Editors

INTERESTING PATENTS: If you are interested in the field of patents, you will want to follow our new feature, "Patents of Interest to Foundrymen," which appeared for the first time on Page 165 of the January issue. In this issue you will find more information on that subject on Page 198.

In the past we have reported on a few important patents in the regular feature, "Foundry Developments."

Now, however, because some of our readers have suggested it, we are checking the *Patent Gazette*, published weekly, for all patent information of interest to foundrymen. Because the number of patents dealing with casting development varies, the new department will appear as the amount of editorial material dictates.

—o—

The Geodesic Dome: Early in December I had the pleasure of attending a press inspection of the

new headquarters building of the American Society for Metals at Metals Park, Novelty, Ohio, 23 miles east of Cleveland. The entire headquarters structure is most interesting and continues to attract much interest.

The building housing the headquarters offices is completely overshadowed by the geodesic dome, said to be the world's largest space lattice. The dome is 103 ft high at the center, 250 ft in diameter, and was constructed of 13 miles of aluminum alloy tubing and tension rods.

I asked the folks at ASM about the number of castings used in the construction of the dome. After considerable checking, they found that 14,940 cast parts were employed in the structure, including compression fittings, tension wheels, plates, clevises, etc.

Underneath the dome the society is building a 100-ft-diam mineral garden which eventually will display approximately 350 specimens of native minerals.

The headquarters continues to attract an increasing number of visitors and sightseers.

—o—

Still Time To Enter: The search to find the oldest operating Simpson mixer is progressing, and winners of the "Handlebar Harry" contest will be announced at the AFS 1960 Casting Congress and Exposition which will be held in Philadelphia, May 9-13.

In pointing out that winners will be selected from the entries after the age of the mixer has been verified by company records, Bruce L. Simpson, president of National Engineering Co., the sponsoring company, has expressed some doubt that the oldest operating mixer is among entries thus far received. In other words, there may be a mixer now in use which can be the winner if someone will take the time to fill out an entry blank.

A Board of Judges appointed by the AFS will select winners in two categories: 1. Age of mixer and, 2. Originality and sincerity of thought expressed in a qualifying 50-word statement. First prize for "Harry" is a trip to Hawaii for two. Other prizes include television sets, shotguns, and sporting goods. Contest officially closes at midnight, Feb. 28, 1960.

—o—

Convention Notes: It has been my privilege to see a most interesting letter which C. J. Freund, dean of engineering, University of Detroit, wrote from Lahore, Pakistan, where he is a consultant with the Commission on National Education of the central government. The following paragraph presented a situation that might well be adopted in this country:

"The hotel (where I spent a little time) faces the lake, about 4 miles from the town of Srinagar, and has

"When it comes to smooth finish and tight tolerances...

we're our own TOUGHEST CUSTOMER"

"For instance, take these cable drums for our Hevi-Duty cranes; they go from cleaning right into assembly—no machining at all, except the bearing surfaces. Means we need rigid control of molding, facing and core sand mixes. Here's where we count on ADM. Their GREEN BOND Bentonite builds up the green strength of our system sand—prevents mold wall movement—keeps dimensions on the button. CROWN HILL sea coal in our facing sand gives the peel I need for an extra-smooth finish. I hear they more than doubled core production with LIN-O-SET, too,—that's ADM's air setting core binder. I play safe with these ADM products, especially where a tough customer like Koehring is calling the shots."

Write ADM for latest information on GREEN BOND Bentonite, CROWN HILL Sea Coal, and LIN-O-SET Air-setting Binder.

Success story reported by Ken Armstrong, Molding Foreman, Koehring Company, Foundry Division, Milwaukee

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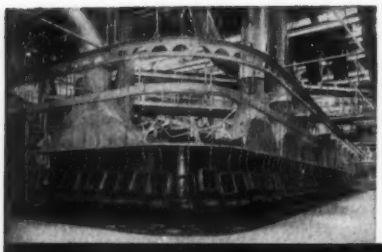
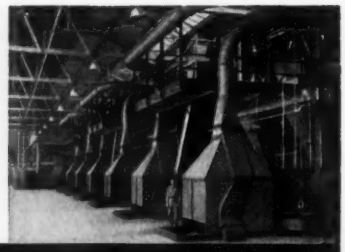


View in new Southern Foundry, shows pouring station with K & B system which removes smoke and fumes as they are formed.



"Shakeouts" in the foundry of a noted implement firm equipped with K & B Dust Control System.

1. DESIGN
2. FABRICATION
3. INSTALLATION

For all three . . . call K & B

K & B Plenum Chamber Hood for mold conveyor operation. Note bolted section construction for ease of maintenance.

For 50 years, Kirk & Blum has specialized in the DESIGN, FABRICATION and INSTALLATION of efficient, dependable systems for the removal of dust and fumes.

DESIGN: Kirk & Blum engineering specialists survey your plant and then design your system, selecting equipment most suitable for your problem.

CONSTRUCTION: Kirk & Blum fabricates the complete system (equipment excepted), "tailor made" for your installation.

INSTALLATION: The Kirk & Blum contract includes responsibility for the entire system, installed by mechanics with years of specialized experience in the installation of such systems. As a result, you have one undivided responsibility—one complete contract for an installed system, ready to operate.

FOR CLEAN AIR . . . THE INVISIBLE TOOL

KIRK & BLUM

DUST AND FUME CONTROL SYSTEMS

The Kirk & Blum Mfg. Company, 3108 Forrer Street, Cincinnati 9, Ohio

a range of mountains in the back yard. It is the former palace of a maharajah and is the best run hotel we have found in Asia, with the possible exception of the great Hilton at Istanbul which, however, is just a standard American hotel in an Oriental setting. This hotel is wonderfully restful and quiet. The guests are orderly, perfectly poised and gracious.

Practically all of the hotel guests are Indian aristocrats and wear Indian costume. There are none of your roaring, bar-leaning citizens with glassy eyes and saliva around the corners of their lips. There is a bar, and it is beautiful, but it is a place where people go for a quiet drink and a visit. Indeed if any citizen were to raise his voice, I suspect that one of the starched and turbaned policeman would bow deeply and say, "It is my high honor to suggest that the sahib may be disturbing the guests."

—o—

Distinguished Service: The Investment Castings Institute has a nice custom of awarding "The Whale" to those of its members or friends who have done an outstanding (or

whale) of a job for the institute and the industry. The distinguished service award consists of a whale—investment cast, of course—mounted on a wooden pedestal with an inscription on the side, as shown in the illustration which appears above.

All of us on FOUNDRY are mighty proud that at the recent annual meeting of the institute, Associate Editor Robert H. Herrmann received the whale award for his work in helping to prepare the institute's new book, *How To Design and Buy Investment Castings.*

Congratulations, Bob, on this honor for a job well done.

F.G.S.

Circle 561 on Page 53

Another new development using

B.F.Goodrich Chemical *raw materials*

NEW LOW-GASSING CORE BINDER FOR LIGHT METAL PRECISION CASTING

NEW GOOD-RITE CB-40 is a unique plastic sand binder especially suited to magnesium and aluminum foundry operations.

Here's how it will cut your costs and improve castings:

Eliminates blow holes... provides finer surfaces: Good-rite CB-40 produces exceptionally small amounts of gas, less than 1/10 as much as is obtained from conventional binders. Finer sands can be used for finishes that need no machining.

Provides dimensional stability: The usual expansion and contraction normally caused by baking is eliminated.

Gives excellent collapsibility and shakeout: Rate of collapse is chemically controlled to prevent burn-in. Collapsed sand flows freely from castings.

More efficient baking: No critical oven control needed. Use any present method, or—for fast baking—blow hot air through core box.

Safe to use... no odors or fumes: Safe at all stages. Non-toxic, will not burn. Releases no objectionable fumes.

In addition, Good-rite CB-40 requires no special equipment techniques. It minimizes need for inhibitors by providing a reducing atmosphere. This core binder is stable in storage, is unaffected by extremes of time or temperature.

You can get complete information, or samples of Good-rite CB-40, by writing Dept. JE-1, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

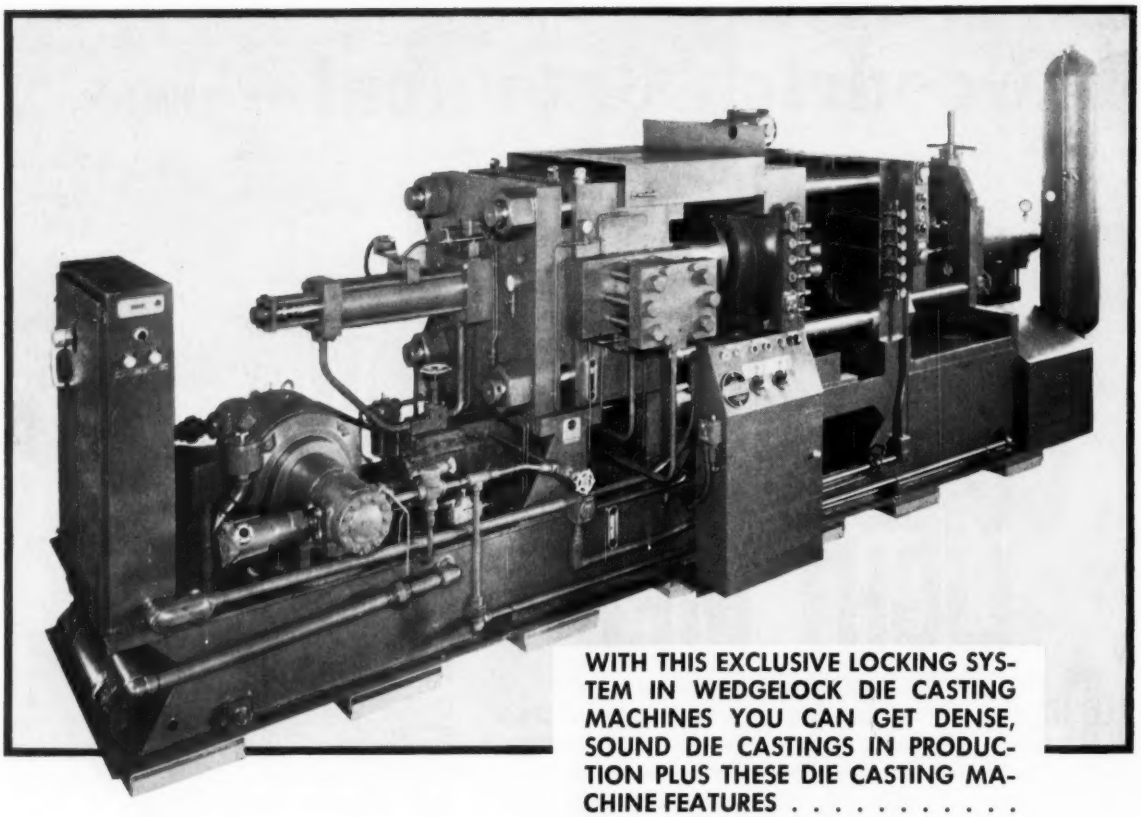
Good-rite CHEMICALS

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich

GEON vinyls • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers

Circle 562 on Page 53



WITH THIS EXCLUSIVE LOCKING SYSTEM IN WEDGELOCK DIE CASTING MACHINES YOU CAN GET DENSE, SOUND DIE CASTINGS IN PRODUCTION PLUS THESE DIE CASTING MACHINE FEATURES . . . . . .

LOCK LUBRICATION

(A WEDGELOCK FIRST)

Our locking system is now completely sealed in and under constant lube oil pressure to all mating surfaces plus a continuous spray to all locking faces to give you long trouble free production.

SIMPLIFIED MAINTENANCE

Ready accessibility to all vital parts, plus independent valving at shot and closing end, all manifolded and gasket mounted with flanged and welded pipe fittings, reduces maintenance time and effort to a minimum.

PRECISION SHOT CONTROL

Adjustable shot plunger and cylinder strokes, plus a WEDGELOCK designed full flow valve from the accumulator bottle direct to the cylinder, to give *pressure, impact* or *speed* as required on your casting problems.

LONGER DIE LIFE

Precision adjusting devices and absolutely uniform closing pressure across the entire die area help prolong die life.

HEAVY DUTY CONSTRUCTION

All structural parts are designed for heavy duty, using substantial steel members and rigid construction. Heavy duty rollers riding on hardened wear plates give smooth die closing action.

EASY DIE INSTALLATION

Motorized die height adjustment and removable tie bars are among the built-in features that make die mounting easy, safe and fast.

HOW WEDGELOCK MAKES IT POSSIBLE TO GET DENSE, SOUND DIE CASTINGS

High pressure can be applied on the metal in the die without danger that die faces will blow open. Two wedges, locked in place by two powerful hydraulic cylinders assure you of positive locking. This patented WEDGELOCK design is the heart of all WEDGELOCK Die Casting Machines. As a safety feature, the wedges must be in before a shot can be made.

COMPLETE SPECIFICATIONS ON OUR LINE OF COLD CHAMBER DIE CASTING MACHINES ARE AVAILABLE. WRITE OR PHONE.

Cuyahoga Industries

Also designers and manufacturers of die casting dies

Cleveland 19, Ohio

Circle 719 on Page 53

Speed production of grey iron castings

EXCELLENT FLOWABILITY of Dexocor binder sand mix gives uniform structure throughout cores—and draws are made easily without sticking.

A large midwestern grey iron foundry finds that:

*"Cores made with Dexocor baked through in 40 to 50 per cent less time—saving fuel dollars and permitting more flexible production scheduling. In addition, green cores, even with high stands or overhang, held perfect shape. Cracking of cores, gas defects and metal penetration were virtually eliminated."

—Dexocor offers other advantages: Better moisture control, excellent flowability, quick, easy mixing, blowing, ramming, easy shake-out—especially when used with Mogul or Kordek binder.

Ask for detailed information and technical help in utilizing this new miracle binder. Contact our nearest sales office.

*Source on request.

DEXOCOR® Binder

Other fine products for the Foundry Industry: MOGUL® and KORDEK® Binders • GLOBE® Dextrines

CORN PRODUCTS SALES COMPANY 17 BATTERY PLACE, NEW YORK 4, N.Y.

with

KRAUSS

Self-Cleaning
Taper Slot

CORE VENTS

Will Not Clog . . .
Leaves No Mark!

Krauss Core Vents are knurled on sides to assure greater gripping power.
Underface — reinforcing rings prevent slots from closing when core vents are hammered into place.

Because the slots are *always open,* cores are harder packed, with no air cushions to cause soft spots. Krauss Taper Slot Core Vents eliminate clogging . . . which means less frequent cleaning. This results in less down time — greater production time. Mail coupon for prices.

WRITE OR CALL TODAY FOR COMPLETE DETAILS

CarVer FOUNDRY PRODUCTS CO.
Muscatine, Iowa

Please rush information and prices on:

☐ Krauss Self-Cleaning Taper Slot Core Vents ☐ Steinex Slower-Hardening Binders

NAME _____ TITLE _____

FOUNDRY _____

CITY _____ STATE _____

CALENDAR of Meetings

Feb. 4-5—Alloy Casting Institute, midwinter meeting, Hotel Key Biscayne, Key Biscayne, Fla.

Feb. 11-12—Wisconsin Regional Foundry Conference, Schroeder Hotel, Milwaukee.

Feb. 14-18—American Institute of Mining & Metallurgical Engineers, annual meeting, Sheraton-Atlantic and Statler-Hilton Hotels, New York.

Feb. 17-18—Malleable Founders' Society, Technical and Operating Conference, Wade Park Manor, Cleveland.

Feb. 18-19—Southeastern Regional Foundry Conference, Thomas Jefferson Hotel, Birmingham.

Mar. 1—Hoist Manufacturers Association, annual meeting, Sheraton-Cleveland Hotel, Cleveland.

Mar. 7-8—Steel Founders' Society of America, annual meeting, Drake Hotel, Chicago.

Mar. 8—Electric Overhead Crane Institute, Drake Hotel, Chicago.

Mar. 16-17—Foundry Educational Foundation, annual college-industry conference, Hotel Statler-Hilton, Cleveland.

Apr. 13-14—Malleable Founders' Society, Market Development Conference, Edgewater Beach Hotel, Chicago.

May 9-13—American Foundrymen's Society, 1960 Castings Congress and Exposition, Convention Hall, Philadelphia.

May 9-13—American Society for Metals, Southwestern Metal Exposition & Congress, State Fair Park, Automobile Building, Dallas.

May 11-13—Los Angeles Chapter, American Material Handling Society, Western Regional Materials Handling Show and Packaging Cavalcade, Great Western Exhibit Center, Los Angeles.

May 23-26—Design Engineering Show, Coliseum, New York.

June 2-3—New York University, vacuum metallurgy conference, University Heights (Bronx) Campus, New York.

June 6-7—Malleable Founders' Society, annual meeting, Elbow Beach Surf Club, Hamilton, Bermuda.

June 6-8—Material Handling Institute Inc., New England Show, Commonwealth Armory, Boston.

June 19-21—Alloy Casting Institute, annual meeting, Homestead, Hot Springs, Va.

July 4-6—European Investment Casters Conference, Liege, Belgium.

Sept. 6-16—The Machine Tool Exposition—1960, International Amphitheatre, Chicago.

Sept. 6-16 — Production Engineering Show, Navy Pier, Chicago.

Sept. 19-20—Steel Founders' Society, fall meeting, Homestead, Hot Springs, Va.

Sept. 19-24—International Foundry Congress, Zurich, Switzerland

Sept. 22-23—National Foundry Association, annual meeting, Edgewater Beach Hotel, Chicago.

Oct. 12—Cast Bronze Bearing Institute, annual meeting, Grove Park Inn, Asheville, N. C.

Oct. 12-14—Gray Iron Founders' Society, annual meeting, Netherland Hilton Hotel, Cincinnati.

Oct. 13-15—Non-Ferrous Founders' Society, annual meeting, Grove Park Inn, Asheville, N. C.

Oct. 17-21—American Society for Metals, National Metal Exposition & Congress, Trade and Convention Center, Philadelphia.

Oct. 20-22—Foundry Equipment Manufacturers Association, annual meeting, Greenbrier Hotel, White Sulphur Springs, W. Va.

Oct. 21-23—Society for Experimental Stress Analysis, annual meeting, Pick Fort Shelby Hotel, Detroit.

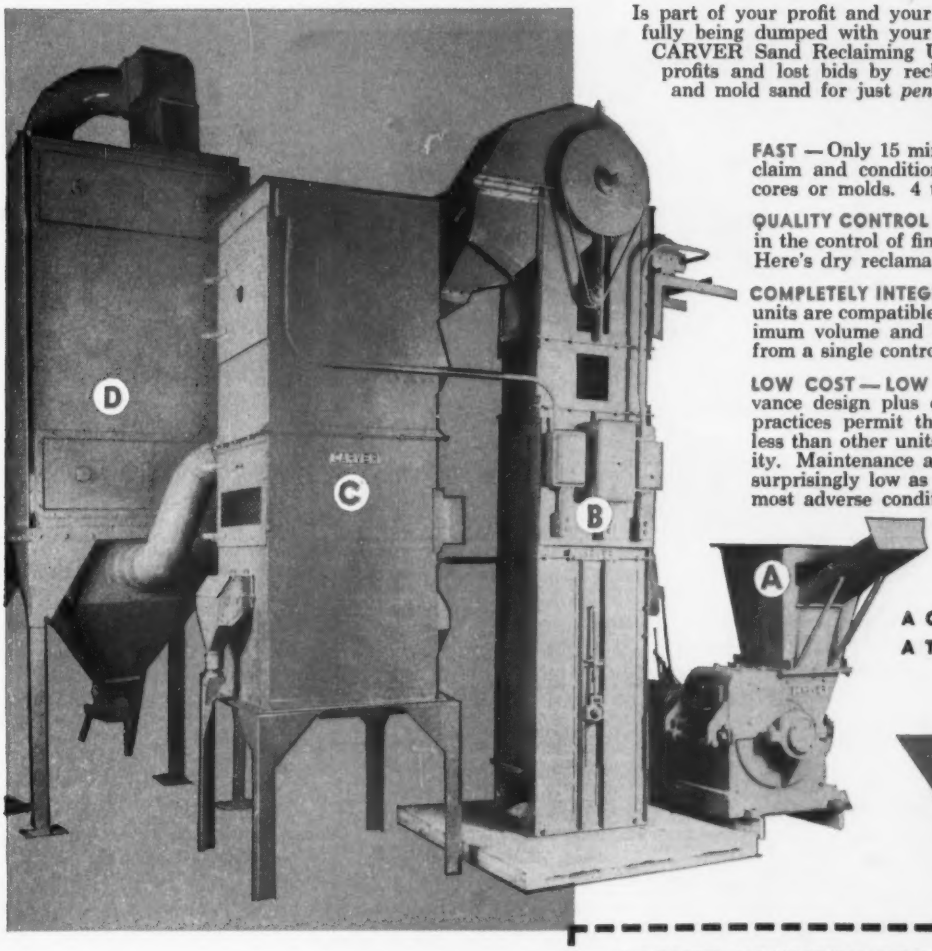
Oct. 22-25—Conveyor Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Nov. 8-10—Material Handling Institute Inc., Central States Show, Kentucky Fair and Exposition Center, Louisville.

Nov. 14-16—Steel Founders' Society, Technical and Operating Conference, Pick Carter Hotel, Cleveland.

Reclaim 75% or more of your sand investment with the FAST new

CarVer SAND RECLAIMING UNIT



Is part of your profit and your ability to bid successfully being dumped with your used sand? The new CARVER Sand Reclaiming Unit can salvage those profits and lost bids by reclaiming used dry core and mold sand for just *pennies per ton!*

FAST — Only 15 minutes to thoroughly reclaim and condition a ton of sand from cores or molds. 4 tons per hour and up!

QUALITY CONTROL — Maximum flexibility in the control of fines and quality of sand. Here's dry reclamation at its best!

COMPLETELY INTEGRATED UNIT — Various units are compatible and designed for maximum volume and efficiency. All operate from a single control unit.

LOW COST — LOW MAINTENANCE — Advance design plus efficient manufacturing practices permit this unit to sell for far less than other units of comparable capacity. Maintenance and operating costs are surprisingly low as well — even under the most adverse conditions of operation.

A COMPLETE UNIT
A TERRIFIC VALUE!

MAIL COUPON TODAY

A **CRUSHER** — Heavy duty with metal remover. Takes oil, synthetic or CO_2 hardened cores or molds.

B **ELEVATOR** — Continuous bucket-type, chain or pulley driven.

C **MILL and SEPARATOR** — Controls fines and has heavy material diverter.

D **CLEANER** — Removes all dust and excessive fines.

CARVER FOUNDRY PRODUCTS CO. F1
1056 Hershey Avenue
Muscatine, Iowa

Please send complete information and prices on new Carver Sand Reclaiming Unit.

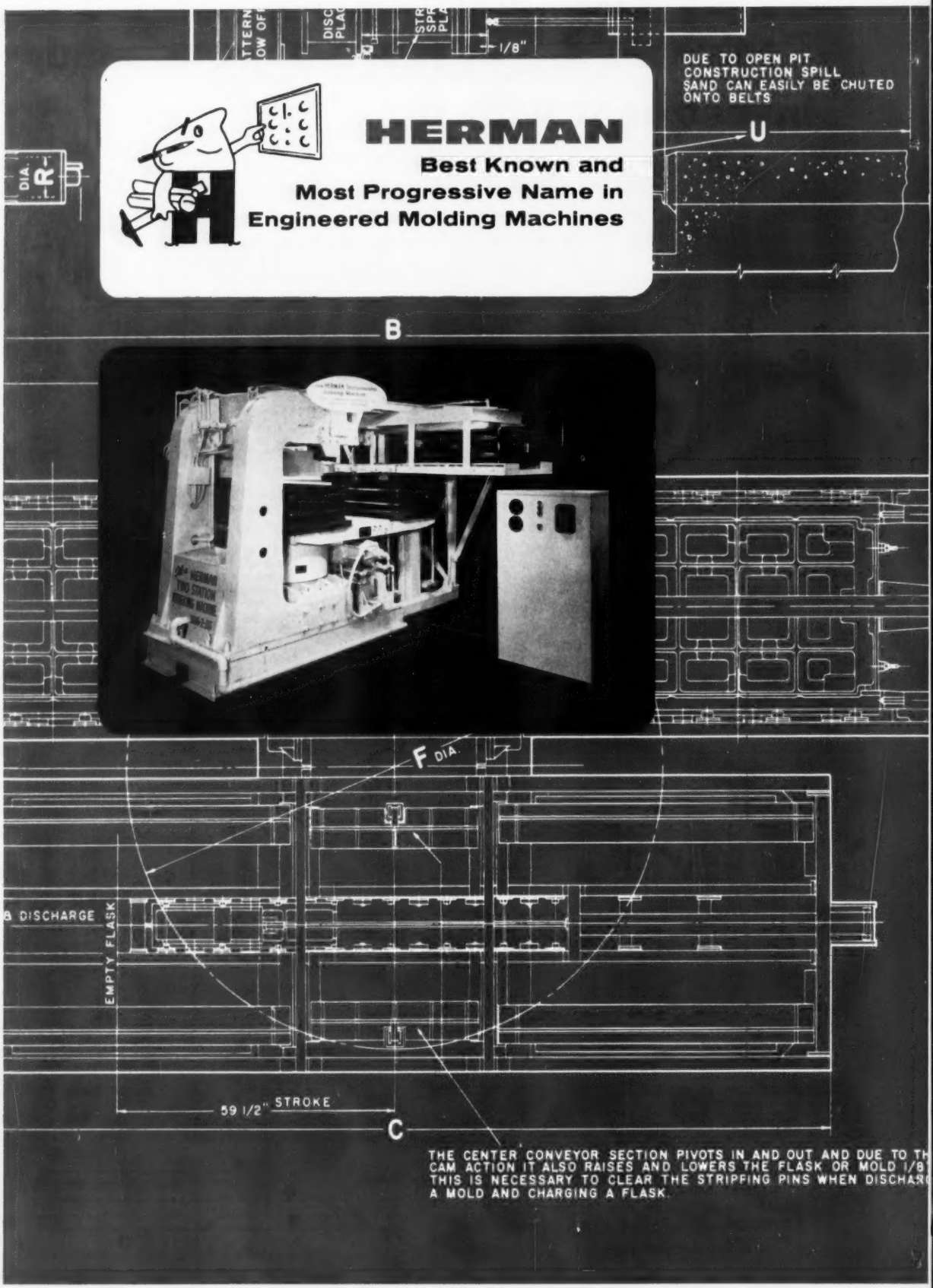
NAME OF FIRM _____

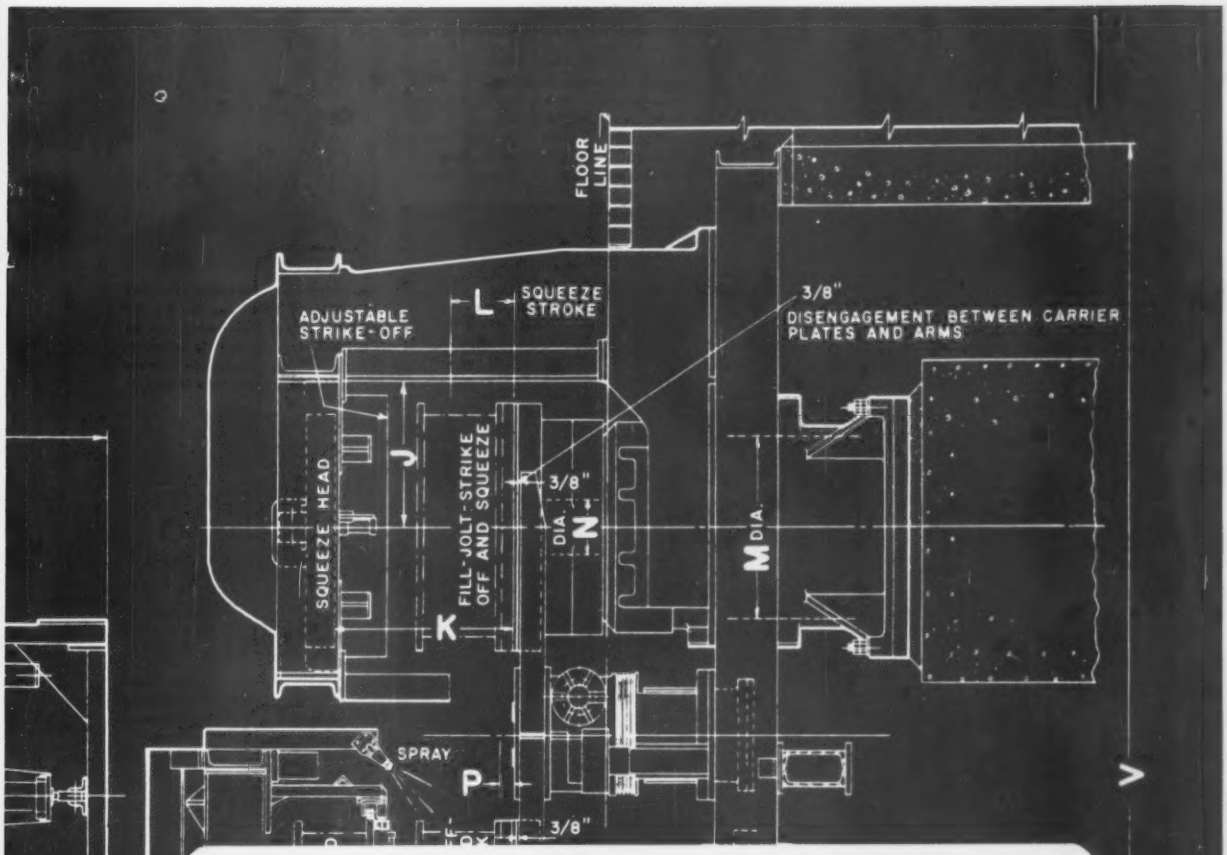
ADDRESS _____

CITY _____ STATE _____

SIGNATURE _____

Circle 565 on Page 53


HERMAN
Best Known and
Most Progressive Name in
Engineered Molding Machines
DUE TO OPEN PIT
CONSTRUCTION SPILL
SAND CAN EASILY BE CHUTED
ONTO BELTS
1/8"
U
DIA
R
B
F DIA.
DISCHARGE
EMPTY FLASK
59 1/2" STROKE
C
THE CENTER CONVEYOR SECTION PIVOTS IN AND OUT AND DUE TO TH
CAM ACTION IT ALSO RAISES AND LOWERS THE FLASK OR MOLD 1/8
THIS IS NECESSARY TO CLEAR THE STRIPPING PINS WHEN DISCHAR
A MOLD AND CHARGING A FLASK.



the Stationmaster, for example...

This Herman development is one of several that have come off our drawing boards in recent years.

The Stationmaster, a 2-station indexing machine, gives you extremely high speed molding, plus flexibility.

One installation produces 200-240 complete molds per hour, in a 40 x 40 inch flask.

There's built-in economy and fast amortization in the Stationmaster, too. One example of this: It replaced 12 squeezers, 6 cope and 6 drag machines previously required.

It can be set up to run automatically or semi-automatically to produce a wide variety of types and sizes.

The indexing principle accelerates production, since one mold can be filled, jolted and squeezed, while another mold is being stripped simultaneously, and removed from the Stationmaster.

All of these features simply exemplify the Herman approach to progressive equipment development, so that a continuing contribution is made to better foundry practice.

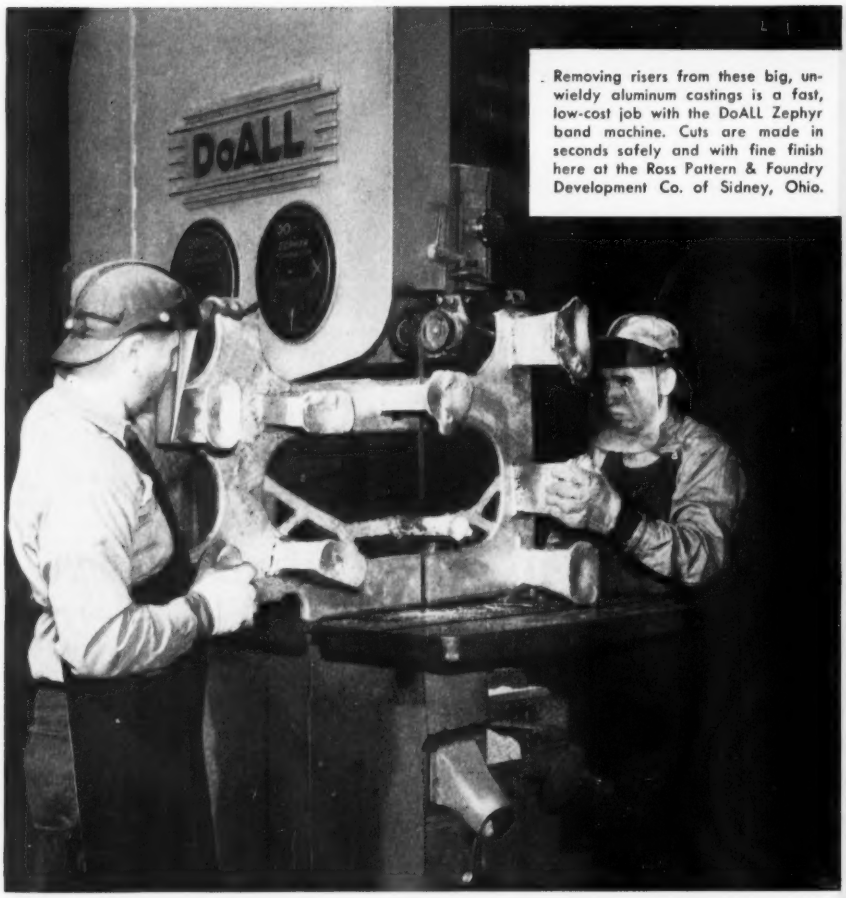
Whatever your requirements may be for molding machines, standard or special, you can turn to Herman with complete confidence.

15 different types are available now . . . and a nearby Herman Sales Engineer will give you practical help in selecting the right one for you.

HERMAN PNEUMATIC MACHINE CO.
UNION BANK BUILDING, PITTSBURGH 22, PA.

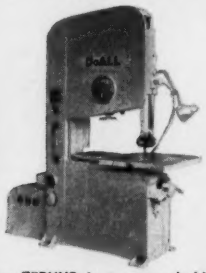
FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

Circle 566 on Page 53

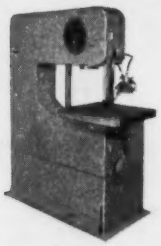


Removing risers from these big, unwieldy aluminum castings is a fast, low-cost job with the DoALL Zephyr band machine. Cuts are made in seconds safely and with fine finish here at the Ross Pattern & Foundry Development Co. of Sidney, Ohio.

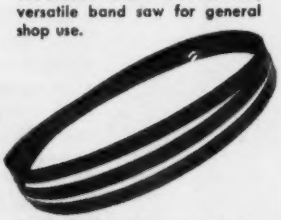
Assisting on this job was Meredith L. Cline of DoALL Dayton Co. He is one of over 200 DoALL Sawing Specialists ready to help foundries achieve higher production at lower costs. Their expert help is free.



The ZEPHYR is a rugged, high-tool velocity sawing machine for production cutting of nonferrous materials and friction sawing.



The UTILITY MACHINE is a low-cost, versatile band saw for general shop use.



DoALL SAW Bands—to saw every metal and material. Over 300 width-pitch-set combinations; 18 styles in both carbon and high-speed steel . . . also file bands, grinding bands and polishing bands. The DoALL friction saw blade is the finest the industry has ever produced!

How DoALL Band Saws Can Help You Cut Foundry Costs

Whether your castings are large or small, simple or complex, ferrous or nonferrous, DoALL has the equipment and the experience to save you both time and money.

For example, Ross Pattern & Foundry Development Co. uses a DoALL Zephyr band machine with a ⅝", 3-pitch blade to cut 2" x 4" risers from these 20" x 48" castings of 108 aluminum. And note the accessibility band sawing offers.

Foundries all over America are using DoALL band machines to cut off gates, risers and flash. These versatile machines also handle many other money-making jobs: slitting, slotting, splitting, notching, beveling, etc. Results: lower production costs, faster deliveries.

DoALL band machines and blades are designed to work together as a high-production team. And they're distributed by a single source that guarantees service and results.

Your nearby DoALL Sawing Specialist understands foundry problems. His experience and the services of the DoALL Research Laboratory are yours for the asking—free. Call your DoALL store today.

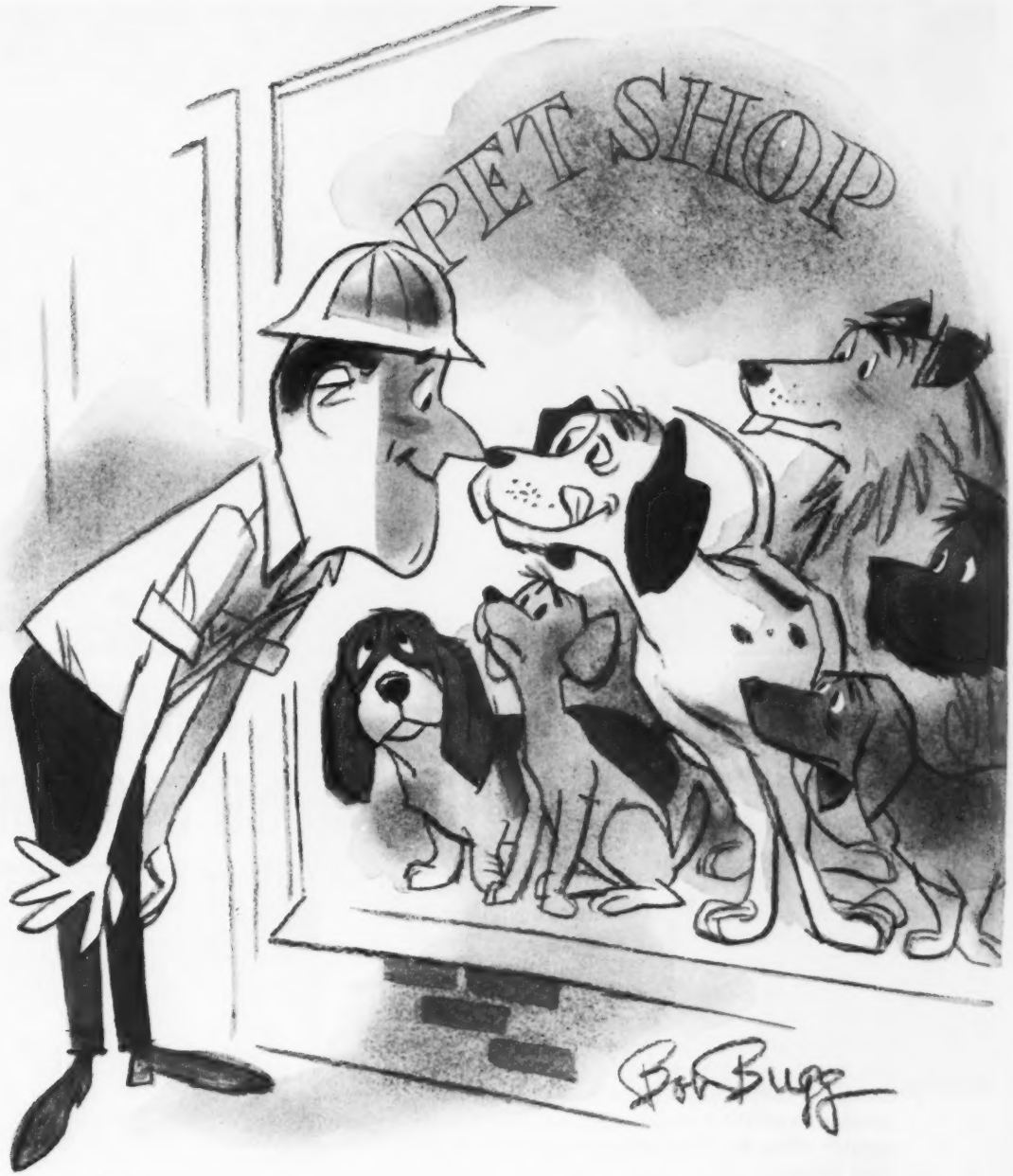
B-59

THIS IS A TYPICAL DoALL STORE

The DoALL Company, Des Plaines, Illinois

Call Your DoALL Service-Store

MACHINE TOOLS ..... CUTTING TOOLS ..... MEASURING INSTRUMENTS ..... SHOP SUPPLIES IN STOCK



You can choose exactly the right type... *Vancoram Alloys for Ductile Iron*

Years of production experience with magnesium additive alloys for ductile iron have proved that no single alloy is ideal for every job. That's why you now have a choice of eight Vancoram Noduloy® Alloys. Let our technical representatives help you select the one best suited to your production conditions and specifications. Noduloy alloys can save you money, too!

And for a powerful graphitizer to complement the Noduloy additive, specify one of the Vancoram Inoculoy® Alloys. Write for literature or call your VCA District Office. Vanadium Corporation of America, 420 Lexington Avenue, New York 17, N. Y. • Chicago • Cleveland • Detroit • Pittsburgh

VANADIUM
CORPORATION OF AMERICA
Producers of alloys, metals and chemicals

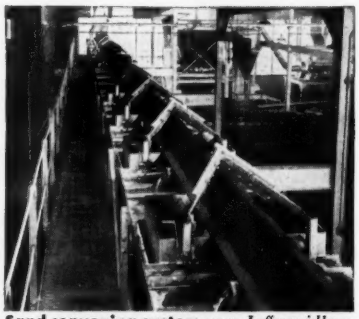
Circle 568 on Page 53

INCREASE FOUNDRY EFFICIENCY WITH SAND HANDLING AND CONDITIONING SYSTEMS

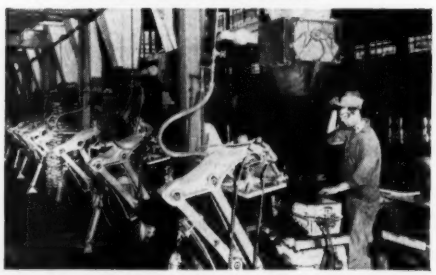
Jeffrey's experience in mechanizing foundry operations covers *your* specific operating conditions.

For example, in handling and conditioning sand, a complete system for handling sand from the molders' stations through pouring, shakeout, conditioning and back to the molders can pay off for the large-run foundry in a short time. Other foundries find a semi-continuous system, with its greater flexibility, more efficient. End result—greater efficiency, stepped up output in existing floor space.

Jeffrey starts with your basic requirements—engineers the right conveying and processing equipment, erects the equipment if desired. Consult Jeffrey for cost-cutting throughout your operations...Sand Handling and Conditioning Systems, Mold Preparation and Handling Equipment, Castings Handling Equipment, Special Unit Machines. For illustrated Catalog 911 write, The Jeffrey Manufacturing Company, 907 North Fourth St., Columbus 16, Ohio.



Sand conveying system *uses Jeffrey idlers for minimum-maintenance service.*



Time is saved *by delivering sand directly to molders' stations.*

CONVEYING • PROCESSING • MINING EQUIPMENT...TRANSMISSION MACHINERY...CONTRACT MANUFACTURING

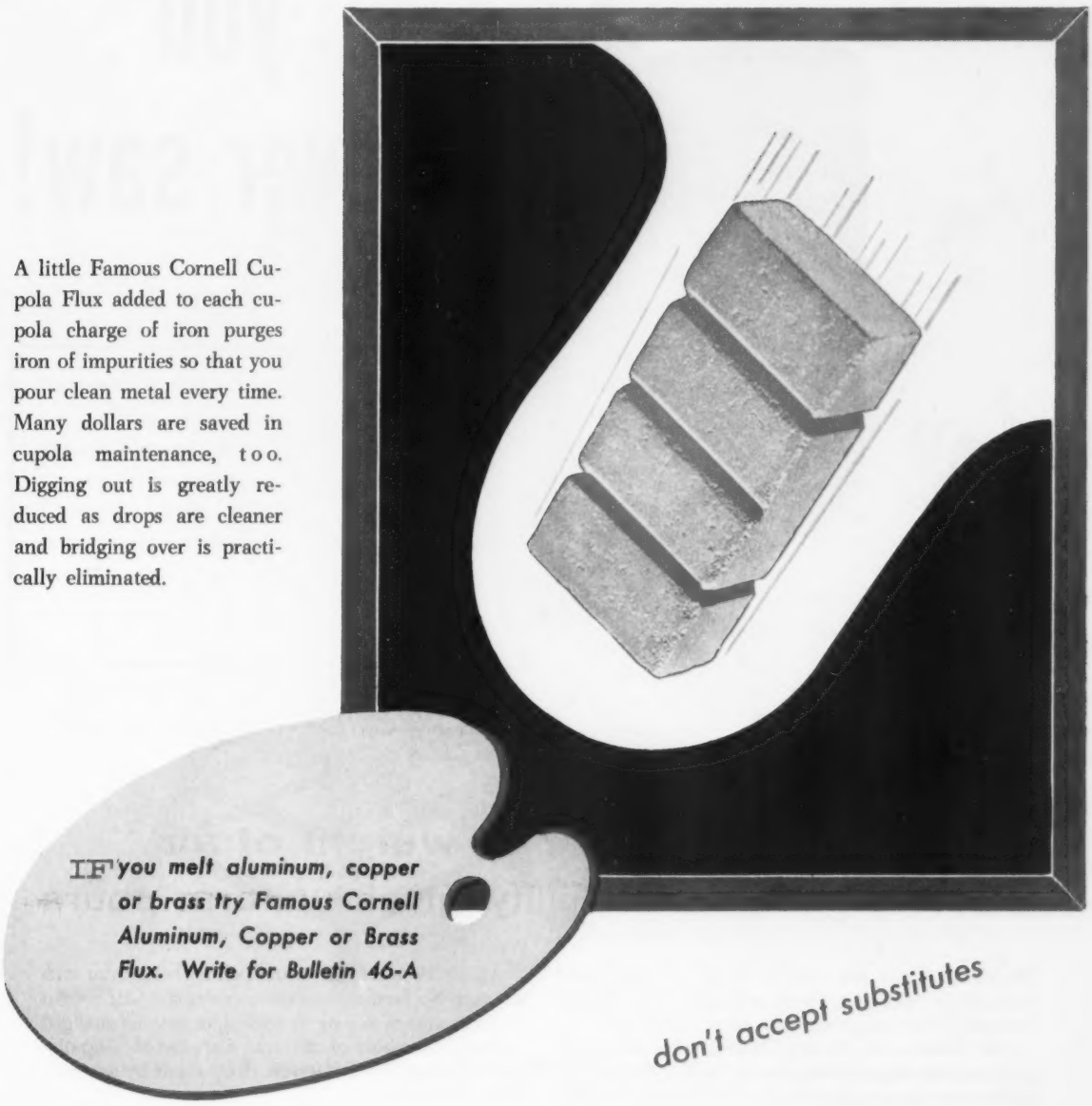
JEFFREY

Circle 569 on Page 53

IF Foundrymen had an ART Gallery for Gray Iron and Malleable Iron Foundries

Famous CORNELL CUPOLA FLUX would be there

A little Famous Cornell Cupola Flux added to each cupola charge of iron purges iron of impurities so that you pour clean metal every time. Many dollars are saved in cupola maintenance, too. Digging out is greatly reduced as drops are cleaner and bridging over is practically eliminated.



IF you melt aluminum, copper or brass try Famous Cornell Aluminum, Copper or Brass Flux. Write for Bulletin 46-A

don't accept substitutes

The CLEVELAND FLUX Company

1026-40 MAIN AVENUE, N. W. • CLEVELAND 13, OHIO

Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes—Since 1918

FAMOUS CORNELL FLUXES

Trade Mark Registered

GEORGE F. PETTINOS, LTD., Hamilton, Ontario, Canada
Exclusive Representatives in Canada

Circle 570 on Page 53

Simplest Efficiency-Booster you ever saw!

Typical installation of Foxboro Air Weight Control . . . readily adaptable to either a centrifugal blower (shown in diagram) or a positive displacement blower.

Controlling cupola blast by **weight of air** cuts pigging, ups quality, gives uniform pours

There's no longer any need to let the weather upset your cupola operation. With a Foxboro Air Weight Controller you can get uniform pours, *every day.*

The Foxboro Air Weight Controller automatically and precisely controls cupola air blast by weight — delivers the correct amount of oxygen for the quantity of coke in the charge. Regardless of ups and downs in atmospheric pressure or temperature, this simple, inexpensive accessory compensates for every change — insures better combustion, more uniform heats, and saves pigging.

All you do is set the control pointer before you start the run. No further attention is necessary. Air weight is held constant as long as desired, or may be changed instantly for pours of different composition. Installation on your present blowers easily made by an experienced pipefitter.

Foxboro Air Weight Controllers are used by more than 1000 foundries. Write for Bulletin 10-10. The Foxboro Company, 322 Neponset Avenue, Foxboro, Massachusetts, U.S.A.

FOXBORO REG. U. S. PAT. OFF. **AIR-WEIGHT CONTROLLERS**

Circle 571 on Page 53

ONLY MAGCOBAR HAS ALL FOUR

the winning combination in your foundry operations

Magcobar
AGRICULTURAL AND INDUSTRIAL PRODUCTS

- YELLOWSTONE, Western Bentonite
- AUTO BOND, Bentonite for Gray Iron
- SOUTHERN STAR, Southern Bentonite
- and, MAGCOBAR SERVICE.

MAGNET COVE BARIUM CORP.

HOUSTON, TEXAS
P. O. Box 6504

ROLLING MEADOWS, ILL.
3950 Industrial Ave.

Circle 572 on Page 53

ACME STEEL'S IDEA INCLUDES WHITING CUPOLAS

Two Whiting hot blast cupolas—the largest in the world—comprise the operational backbone of Acme Steel Company's unique new steel plant in Chicago. With base plate shell diameters of 156" and effective hearth diameters of 114", the eight-story high water-cooled units work in conjunction with oxygen converters to produce high-quality steels in multiple small-order batches. Each of the cupolas has an hourly capacity of 50 tons of metal. Supplementing them is a variety of other Whiting foundry equipment—charging trolleys and buckets, hot metal mixers, ladles and hoppers—all helping to provide a capacity of 450,000 ingot tons a year at this new steel making facility.

For the complete story of this plant, the only installation of its kind in this hemisphere, write for your copy of the WHITING FOUNDER, Winter issue. *Whiting Corporation 15607 Lathrop Avenue, Harvey, Illinois.*

87 OF AMERICA'S "FIRST HUNDRED" CORPORATIONS ARE WHITING CUSTOMERS

FOUNDRY EQUIPMENT

WHITING

MANUFACTURERS OF CRANES; TRAMBEAM® HANDLING SYSTEMS; PRESSUREGRIP; TRACKMOBILES®; FOUNDRY, RAILROAD, AND SWENSON CHEMICAL EQUIPMENT

Circle 573 on Page 53

From a pile of sand to a rigid mold in 4 minutes

Core for automotive spring hanger

Sodium Silicate-CO_2 Process

You can produce cores in a matter of seconds with the sodium silicate-CO_2 process. With this quicker core-making technique, a binder based on Du Pont Sodium Silicate is mixed with fine core sand . . . CO_2 is the curing agent.

During gassing, CO_2 reacts with the sodium silicate to form a tough gel that hardens while sand is in *direct contact* with patterns. Strong, high-tolerance cores are produced . . . yet collapse easily during shake-out.

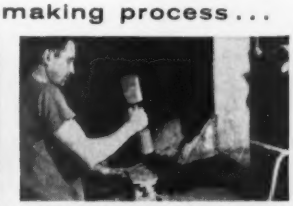
The sodium silicate-CO_2 process offers production-line speed . . . eliminates the need for drying and baking equipment. Cores are ready for metal pouring *immediately* after curing. The over-all production cycle is faster. And foundry workers prefer CO_2 molding because there are no objectionable fumes.

Ask your foundry supplier for full details about this time- and money-saving process, or write us for names of suppliers of binders based on Du Pont Sodium Silicate. *E. I. du Pont de Nemours & Co. (Inc.), Industrial and Biochemicals Dept., Room N-2533, Wilmington 98, Delaware.*

DU PONT
REG. U.S. PAT. OFF.
BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

Steps in CO_2 core-making process . . .

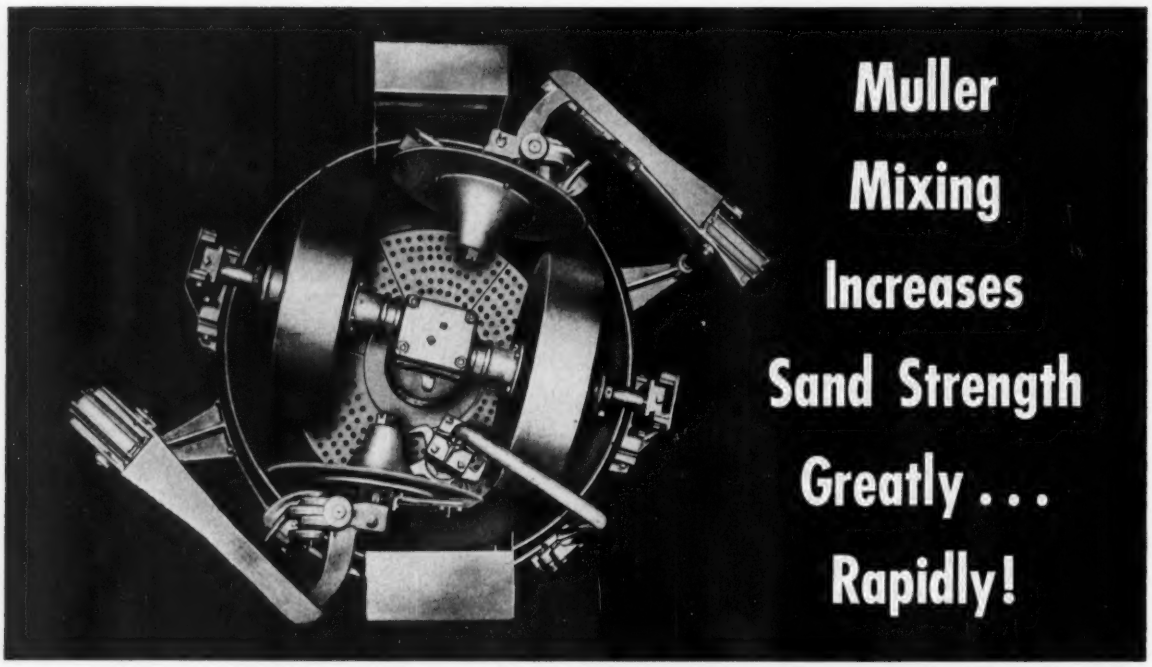
1. Standard muller is used to mix sodium silicate-based binder and core sand.



2. Mixed core sand is tamped into form, then packed with pneumatic rammer.

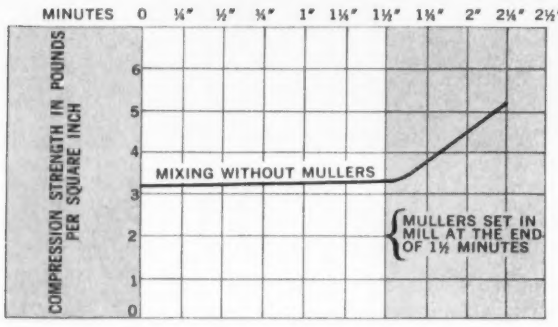
3. Packed core mold is placed over CO_2 jet and quickly cured by gassing.

4. Cured cores are **immediately** ready for metal pouring.



Muller Mixing Increases Sand Strength Greatly . . . Rapidly!

Sand Strength Curve Proves the Difference



This Strength Curve Chart demonstrates how much more effective muller mixing of sand is over regular scraper type mixing. In this test a Clearfield mixer was used to mix a charge of 91% burned sand, 3% bond and 6% water. At the start of the run the mulling wheels were removed completely . . . the batch was charged and the mixing operation continued for 1½ minutes with only the disc and agitator operating on the material. *There was only a slight increase in the strength of the sand.* Then the mullers were set into the machine and operation on the same batch continued for 1¼ minutes. During this very short period with the mullers operating, *the sand strength increased very rapidly.* You can speed production, with assured quality results—and cut costs too—with a Clearfield muller-type mixer. *Let us prove the superiority of Clearfield Muller-type Mixers with a sample run of your own batch. Just call us.*

WITH its speed, dependability and special mixing features, a Clearfield Mixer prepares your sand properly and exactly as you want it . . . thus paying for itself many times over. In addition to the strength-building mullers, Clearfield Mixers have other features that assure quality results every time. First, all Clearfield Mixers work on the rotating pan principle so that every particle in the batch is kept in continuous motion, with the ingredients alternately spread and gathered together to maintain highest mixing efficiency.

Another feature is the patented star-shaped agitator which covers the entire flat surface of the revolving bottom and prevents material from forming hard cakes or lumps. The agitator is driven automatically by the force of the sand being rotated by the pan motion; a "whirlpool" action is created, speeding up the mixing process and promoting clean emptying of the pan.

The Clearfield double-duty disc, also patented, cuts all the material free from the revolving pan rim at each revolution, turns it over and diverts a continuous roll of material under the mullers. (Moved to the discharge position, this disc unloads the complete batch in 15 to 20 seconds!)

You get thorough, proper blending and mixing when you use a Clearfield Mixer.

for complete details about the wide variety of Clearfield Mixers, write for Catalog No. 90

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Circle 575 on Page 53

Circle 576 on Page 53→

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A REPORT TO FOUNDRIES

FROM TOM BARLOW

Reducing diet for castings

Everyone seems to have a pet diet (or has had one lately). All you have to do is put on a few pounds and you'll get more advice than you can possibly use. I just read about the last word in quick-reducing methods. It is utterly simple — just gin and cigarettes — no food. It is guaranteed to take off 50 pounds — just before you die (unless you die prematurely).

Castings need a diet, too. Overweight castings do no one any good — they cost everyone money. You, the customer, the machine shop: all get taken. Just for example, overweight castings (like overweight people) are always overfed. They have to be. Overfeeding (foundrymen refer to risers, feeders or headers) a casting reduces yield. Lower yield means lower profits — and on and on. If you want better yield, reduce mold-wall movement — make castings closer to pattern size—and reduce casting weight.

As with any diet, the technique is basically simple. For humans it means eating less food. With castings, it merely means using stronger sand and/or more molding energy. The only catch is how to do this as painlessly as possible. Let's see what takes place — see if a painless method will show up.

If sand grains could talk, they might adopt the motto, "United we stand—divided we fall." Sand strength is the result of togetherness. Clay imparts strength largely because it permits the sand grains to pack together. Pick up a handful of Black Hills Bentonite and wet it. It is slippery like soap—not sticky like glue. High-strength sands are flowable — almost by definition. They are strong because they are flowable to the point that the grains pack

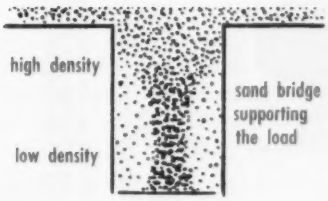
together tightly. Why then do we back up on strength to get a "more flowable" sand? A simple test illustrates the answer — and the secret of our reducing diet for castings.

If we use a simple pattern involving a pocket, we can study the effect of strength, ramming, sand additives and many other factors. Such a pattern might look like this:

It should have a simple pocket — not too hard to ram, but not too easy, either. A pocket 2 inches wide, 6 inches long and 3 inches deep is as good as any. There is no standard for this test. If we start with a sand of about four pounds strength and gradually increase the strength, we can measure a very definite change. Using a standardized method and energy of squeeze, jolt, sling, hand ram or what have you, we find:

1. The mold hardness on the flat areas will increase — indicating an increase in flowability (or better, moldability) with increasing strength.
2. The mold hardness of the sides and bottom of the pocket will increase up to some point — and then suddenly decrease.

At the point of decrease we have reached the strength of bridging. The flowability of the sand has increased to the point where the sand rams itself into a bridge and prevents further flow into the bottom of the cavity.



So the molder asks for weaker sand — *but not to gain flowability*. He wants to lose flowability and avoid the forming of a bridge! When he accomplishes this, he also loses all these advantages of strong sand:

Better yield	1. Better finish 2. Less mold breakage 3. Reduced casting weight 4. Faster molding 5. Easier (cleaner) core setting 6. Fewer defects	**Better yield**

In other words, his castings get fat. They require more feeding — which makes them even fatter. Yield is down—profits are down.

How to break the bridge without reducing strength? How do we stick to the diet of strong sand? Ram harder? Yes, this makes sense. (Hence, high-pressure molding.) But for every machine there is still a point at which the sand will bridge.

This characteristic of sand can be changed. That is the reason for PLASTI-BOND, TRIPLACT, Z-FLO and MAPLEX. The correct one for your application can be determined easily. Our engineers now have a lot of background to help you. For example, a 14-lb. sand with PLASTI-BOND will ram solid where a 9-lb. sand without it may bridge. The additive is the little extra (that clays alone do not have — even our clays) that lets your castings successfully stay on the reducing diet they need.

Raising the strength without using additives is like cutting down on potatoes but not on gravy — nothing happens. Sometimes (unfortunately) adding things like PLASTI-BOND without raising the strength is like cutting down on gravy but not on potatoes — it just ain't enough. Fortunately, the addition of PLASTI-BOND, Z-FLO or TRIPLACT normally raises the strength automatically (and by design). The secret is to keep the strength up — or even raise it.

We have all the ingredients for a successful diet for your castings. We also have the "doctors" to make the diet as effective as possible. Do you have the need?

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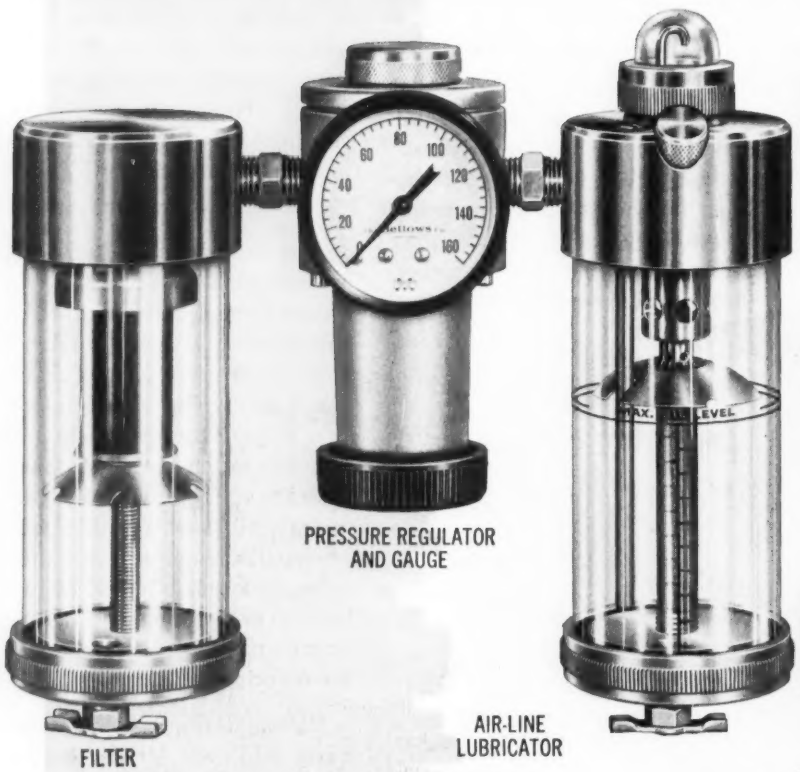

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675-C

Late News

NEED EQUIPMENT: U. S. foundries will need more than $509 million worth of new capital equipment during the next two years, according to a survey just completed by American Foundrymen's Society, Des Plaines, Ill. The total breaks down to about $440 million for ferrous foundries and $69 million for nonferrous. The survey indicates anticipated production of 37.6 million tons of finished castings in the two-year period, 1960 and 1961. In addition to the capital needs, foundries expect to spend nearly $6800 million for materials, supplies, and special services during the two years.

SCRAP PRICES LAG: Latest figures from the Bureau of Labor Statistics show iron and steel scrap prices lagging far behind that of pig iron, according to the Institute of Scrap Iron & Steel Inc. BLS figures indicate that the scrap index for November stood at 113.3 of the 1947-49 base periods, whereas pig iron was at 166.2, for the same base years. The institute also points out that scrap prices declined still further in December. The index for finished steel was 186.8, and that for foundry products was 166.4.

AFS AWARD WINNERS: Board of Awards, American Foundrymen's Society, has recommended the following awards for presentation at the 64th Castings Congress, to be held in Philadelphia May 9-13: *Wm. H. McFadden Gold Medal*—Samuel F. Carter Jr., American Cast Iron Pipe Co., Birmingham. *Thomas W. Pangborn Gold Medal*—W. W. Levi, consulting metallurgist, Radford, Va. *Joseph S. Seaman Gold Medal*—Theron D. Stay, technical advisor, Reynolds Metals Co., Cleveland.

Foundry Statistics

Iron and Steel Scrap Consumption

(Gross tons*)

	All Scrap Total	By Types of Furnace — Cupola Total	Air Total	Electric Total
1957	65,688,592	9,220,405	1,026,951	8,876,400
1958				
June	4,409,006	615,271	62,703	605,733
6 mo. ..	22,982,262	3,751,164	390,428	3,347,626
July	3,716,739	543,726	47,203	513,394
Aug.	4,203,034	580,844	66,877	592,727
Sept.	4,472,219	680,660	71,198	637,400
Oct.	5,091,207	707,378	90,707	757,722
Nov.	4,803,615	700,704	74,382	691,078
Dec.	4,973,670	761,494	80,593	712,779
Total ...	50,242,746	7,725,970	821,388	7,152,726
1959				
Jan.	5,375,042	783,045	86,519	767,289
Feb.	5,657,873	791,137	88,326	801,692
Mar.	6,677,499	873,982	101,986	965,048
Apr.	6,644,905	911,313	106,972	996,126
May	6,642,572	868,661	99,256	1,029,573
June	6,322,404	885,497	104,683	997,921
6 mo. ..	37,338,295	5,113,635	607,742	5,557,649

Index of Foundry Equipment Orders

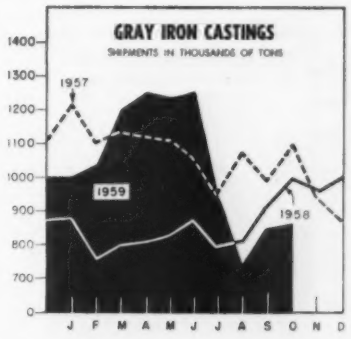
Foundry Trades Only

(Net Orders Closed, New Equipment)

	1958	1959
Jan.	57.9	127.4
Feb.	57.6	237.1
Mar.	85.9	166.6
Apr.	88.7	154.2
May	136.1	157.0
June	87.7	125.1
July	77.9	110.7
Aug.	74.1	134.1
Sept.	64.5	131.3
Oct.	118.9	140.8
Nov.	83.3	131.2
Dec.	137.0	....

Note: Base period 1947-49 taken as 100 per cent monthly average.

Source: Foundry Equipment Manufacturers Association.



GRAY IRON CASTINGS—SHIPMENTS

(Net tons)[1]

	All Castings — Total	All Castings — For Sale	Miscellaneous Castings Total	Nodular Iron Castings Total	Heavy Steel Ingot Molds Total	Chilled Railroad Car Wheels Total	Pressure Pipe & Fittings Total[2]	Soil Pipe & Fittings Total[2]	Unfilled Orders[2]
1957	12,664,504	6,876,497	7,786,229	3,310,915	.....	2,409,290	359,332	1,351,345	758,308	.....
1958										
Oct.	992,730	586,614	551,330	253,062	10,857	207,500	22,970	129,375	81,505	619,667
10 mo. .	8,415,318	4,839,365	4,951,072	2,179,239	92,785	1,473,750	228,292	1,094,180	668,024	.....
Nov.	958,306	505,290	575,586	231,669	11,731	201,704	18,801	98,326	63,889	602,375
Dec.	997,608	509,499	628,720	246,289	13,072	208,942	18,021	85,179	56,746	608,096
Total ...	10,371,232	5,863,154	6,155,378	2,657,197	117,588	1,884,396	265,114	1,277,685	788,659	.....
1959										
Jan.	1,001,771	517,390	625,604	250,161	12,061	214,985	27,650	75,371	58,056	697,245
Feb.	1,036,655	538,514	642,882	252,115	12,619	230,706	31,035	76,147	55,885	787,360
Mar.	1,205,572	666,034	701,527	286,692	13,881	270,293	35,820	108,131	89,801	846,937
Apr.	1,245,702	688,755	726,105	295,982	14,563	270,476	35,655	129,861	83,605	892,214
May	1,236,250	655,285	706,073	285,507	16,003	275,563	38,960	141,675	75,979	834,779
June	1,252,016	717,067	707,291	295,064	15,510	288,479	30,723	160,540	84,983	836,707
July	943,436	532,976	602,261	252,907	14,508	107,604	20,486	133,175	79,960	897,536
Aug.	743,564	506,756	485,444	254,232	11,046	13,482	18,479	145,853	80,306	872,993
Sept.	850,043	528,145	595,435	279,357	11,875	19,416	16,272	142,660	76,260	883,278
Oct.	871,779	520,322	622,599	277,927	17,797	20,155	19,647	139,716	69,662	886,970
10 mo. .	10,356,848	5,901,244	6,415,221	2,729,944	139,963	1,691,159	272,727	1,253,328	754,497	.....

*Source: U. S. Dept. of Interior Bureau of Mines. [1]Source: Bureau of Census. [2]For sale only. [3]All cast iron pipe is shipped for sale.

Late News

Awards of Scientific Merit—George P. Halliwell, H. Kramer & Co., Chicago; George A. Timmons, Climax Molybdenum Co., Detroit; William M. Ball Jr., R. Lavin & Sons Inc., Chicago; and Victor E. Zang, Unitcast Corp., Chicago.

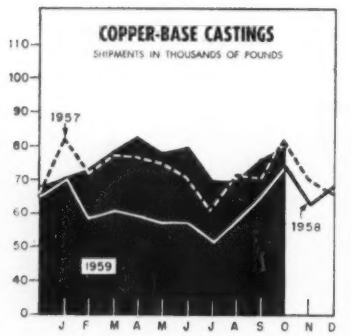
STEEL FOUNDERS ELECT: Wilson H. Moriarty, first vice president, National Malleable & Steel Castings Co., Cleveland, has been elected president of the Steel Founders' Society of America. Other officers included F. B. Powers, Burnside Steel Foundry Co., Chicago, vice president; R. M. Schumo, Pennsylvania Electric Steel Casting Co., Hamburg, Pa., executive committee; and R. G. Parks, National Malleable & Steel Castings Co., treasurer. Re-elected were F. Kermit Donaldson, executive vice president and secretary; Charles W. Briggs, technical and research director; George K. Dreher, market development director; and Erwin Dieckmann, assistant secretary.

FOUNDATION MOVES: The Malleable Research and Development Foundation has moved its headquarters from Granville, Ohio, to 601 N. Broadway, Dayton, Ohio. John A. Wagner, president, Wagner Malleable Iron Co., Decatur, Ill., has been elected chairman of the trustees of the foundation.

IHEA OFFICERS: W. E. Benninghoff, Ohio Crankshaft Co., Cleveland, was elected president of the Industrial Heating Equipment Association at its annual winter meeting in Philadelphia Jan. 18-19. Other officers are H. J. Pugsley, Swindell-Dressler Corp., Pittsburgh, vice president, and Roy R. Snyder, W. S. Rockwell Co., Fairfield, Conn., treasurer. C. J. Schmidt, J. O. Ross Engineering Div., Midland-Ross Corp., New York, was elected to the executive committee, and Robert E. Fleming was re-elected executive vice president of the association.

PERSONALS: Grover L. Michael has retired as president, McConway & Torley Corp., Pittsburgh. He has been succeeded by Richard E. Bowe, who will serve as president and treasurer. Donald Y. Clem, executive vice president, also has been elected to be secretary, in which capacity he replaces Mr. Bowe . . . Elmer E. Braun has been appointed works

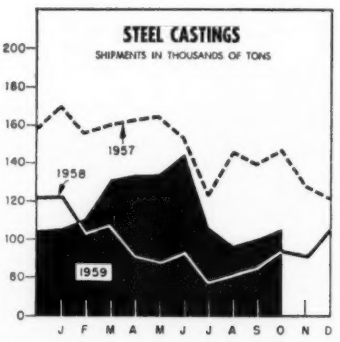
Foundry Statistics



COPPER-BASE CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments			Unfilled Orders[2]
	Total	Sand	Perm. Mold	
1957	874,627	789,014	44,789	.....
1958				
Oct.	76,386	70,254	2,824	26,726
10 mo..	627,860	574,170	26,475	.....
Nov.	64,746	59,690	2,274	24,928
Dec.	69,878	63,500	3 105	25 078
Total ..	762,484	697,360	31,854	.....
1959				
Jan.	70,123	62,266	3,753	25,344
Feb.	72,754	64,558	4,007	26,468
Mar.	78,641	69,472	4,333	29,373
Apr.	82,799	73,567	4,640	29,941
May	78,413	69,351	4,363	27,074
June	79,366	70,512	4,421	30,389
July	69,073	61,650	3,869	31,820
Aug.	68,979	60,346	4,410	32,117
Sept.	75,739	66,211	4,809	29,396
Oct.	79,832	69,583	5,172	28,092
10 mo. .	755,719	667,516	43,777	.....



STEEL CASTINGS—SHIPMENTS

(Net tons[1])

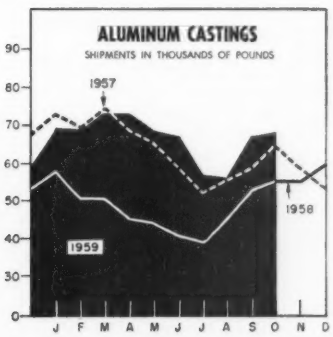
	All Castings			Carbon			Alloy			
	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Unfilled Orders[2]
1957	1,766,191	1,359,747	349,059	1,328,478	1,019,090	324,951	437,713	340,657	24,108	.....
1958										
Oct.	95,389	73,367	12,254	67,906	51,065	10,980	27,483	22,302	1,274	184,925
10 mo.	931,933	710,060	126,809	666,038	501,261	115,816	265,895	208,277	10,993	.....
Nov.	85,267	65,788	9,648	59,793	45,808	8,501	25,474	19,980	1,147	193,960
Dec.	103,800	81,360	13,187	76,015	59,171	11,934	27,785	22,189	1,253	214,352
Total	1,121,000	856,986	149,644	801,846	606,240	136,251	319,154	250,746	13,393	.....
1959										
Jan.	105,392	82,683	14,408	76,242	59,027	12,948	29,150	23,656	1,460	232,646
Feb.	110,280	86,013	14,686	79,365	61,261	13,316	30,645	24,752	1,370	245,096
Mar.	131,317	103,848	20,086	93,309	75,968	18,410	35,008	27,880	1,676	270,682
Apr.	134,344	104,890	21,372	99,295	76,802	19,761	35,049	28,088	1,611	271,613
May	135,359	105,804	23,825	101,504	78,767	22,498	33,855	27,037	1,327	263,969
June	143,624	111,725	26,567	107,000	82,485	24,568	36,624	29,240	1,999	248,782
July	106,790	83,541	16,007	78,316	60,502	14,520	28,474	23,039	1,487	274,065
Aug.	98,014	79,188	17,607	74,825	60,243	16,373	23,189	18,945	1,234	279,261
Sept.	99,731	79,963	13,975	73,648	58,453	12,830	26,083	21,510	1,145	256,871
Oct.	105,570	84,850	11,819	80,127	63,901	10,978	25,443	20,108	841	268,874
10 mo.	1,170,421	922,505	180,352	863,631	677,409	166,202	303,520	244,255	14,150	.....

[1]Source: Bureau of the Census. [2]For sale only.

manager, Central Foundry Div., General Motors, and will be responsible for both ferrous and nonferrous metals operations in all five plants of the division . . . William B. Wallis has resigned as president, Lectromelt Furnace Div., McGraw-Edison Co., Pittsburgh. On Mar. 1 he will become associated with Strategic Materials Corp., New York, as a consulting engineer to assist in the promotion of the Strategic Udy process . . . Paul Magnus II has been elected executive vice president, Rosedale Foundry & Machine Co., Pittsburgh. He is succeeded as vice president by Donald H. Ambrose, formerly foundry superintendent . . . Burleigh E. Jacobs Jr. has been elected president, Grede Foundries Inc., Milwaukee. He succeeds William J. Grede, who becomes chairman of the board.

OBITUARY: George H. Hammon, secretary and superintendent, Fairfield Aluminum Castings Co., Fairfield, Iowa, died Dec. 31 . . . Lazarus Chapman, 65, board chairman, H. Kramer & Co., Chicago smelters and refiners, died Jan. 15 . . . John W. Horner Sr., 81, president, Slack-Horner Brass Mfg. Co., Longmont, Colo., died Dec. 31 . . . John E. Stock, 55, superintendent of foundry processes and methods, John Deere Waterloo Tractor Works, Waterloo, Iowa, died Dec. 22.

MISCELLANY: Osborn Mfg. Co., Cleveland, has appointed Midvale Mining & Mfg. Co., 5015 Manchester Ave., St. Louis 10, Mo., as sales and service representative for its molding machine division in Missouri, Kansas, Nebraska, Oklahoma, Arkansas, southwestern Illinois, and metropolitan Council Bluffs, Iowa . . . Primary aluminum production in 1959 totaled 1,790,043 tons through November as compared to 1,413,255 tons in the same 1958 period . . . Hysol Corp. is the new name of the former Houghton Laboratories, Olean, N. Y. . . . Superior Electrocast Foundry Co., South San Francisco, Calif., has formed a new subsidiary, Superior Alloys Co., situated adjacent to its own plant, to produce high quality stainless steel castings . . . Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., has changed its name to Birdsboro Corp. . . . Wheelabrator Corp., Mishawaka, Ind., has acquired about 80 per cent of the controlling stock of Lord Chemical Corp., York, Pa., manufacturer of vibratory and barrel-type finishing equipment.



PRODUCTION WORKERS

Estimated Number

	Sept. 1959	Aug. 1959	Sept. 1958
Ferrous	195,700	194,100	164,800
Nonferrous	54,300	52,900	47,700

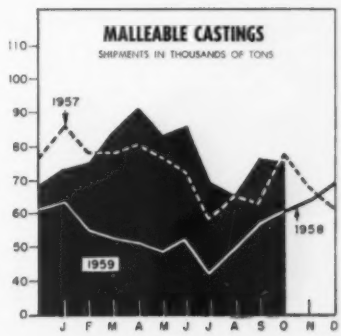
Average Weekly Earnings

Gray Iron	$95.76	$94.80	$87.25
Malleable Iron	93.84	95.34	88.94
Steel	98.16	100.19	92.61
Nonferrous	100.86	99.39	95.18

Average Weekly Hours

Gray Iron	39.9	40.0	38.1
Malleable Iron	39.1	40.4	38.5
Steel	38.8	39.6	37.8
Nonferrous	41.0	40.9	40.5

Source: Bureau of Labor Statistics.



ALUMINUM CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments Total	Sand	Perm. Mold	Die	Unfilled Orders[2]
1957	751,818	143,991	232,326	373,586	.....
1958					
Oct.	59,639	11,663	20,796	27,032	73,474
10 mo.	517,686	102,443	180,636	233,008	.....
Nov.	59,836	11,318	20,508	27,904	76,370
Dec.	64,178	11,726	22,948	29,363	78,732
Total	641,700	125,487	224,092	290,275	.....
1959					
Jan	68,896	11,238	24,844	32,813	83,314
Feb	68,381	10,802	25,428	32,147	82,001
Mar.	73,351	12,412	26,964	33,949	82,676
Apr.	72,976	12,700	26,153	33,992	85,636
May	68,268	11,979	25,283	30,877	80,325
June	66,479	12,312	24,927	29,092	81,228
July	56,911	11,581	20,410	24,786	80,450
Aug.	55,904	11,130	17,824	26,818	82,488
Sept.	66,193	12,309	21,506	32,239	81,839
Oct.	67,580	12,958	21,781	32,721	79,126
10 mo.	664,939	119,421	235,120	309,434	.....

[1]Source: Bureau of the Census. [2]For sale only.

MALLEABLE IRON CASTINGS

(Shipments of castings—net tons[1])

	Shipments Total	For Sale	Standard Total	For Sale	Pearlitic Total	For Sale	Unfilled Orders[2]
1957	862,976	520,118	713,539	431,662	149,437	88,456	.....
1958							
Oct.	60,981	40,014	50,181	31,992	10,800	8,022	63,426
10 mo.	528,919	309,577	436,739	252,305	92,169	56,272	.....
Nov.	63,356	35,221	50,063	28,409	13,293	6,812	66,725
Dec.	68,385	44,041	53,797	32,883	14,588	7,158	65,904
Total	660,650	383,839	540,600	313,597	120,050	70,242	.....
1959							
Jan.	73,186	43,667	56,709	35,139	16,486	8,528	77,322
Feb.	74,760	42,093	57,573	31,976	17,187	10,117	90,291
Mar.	84,335	49,690	67,439	40,515	16,896	9,175	95,822
Apr.	90,974	54,306	75,583	43,835	18,391	10,471	102,508
May	83,472	49,619	66,512	40,438	16,960	9,181	99,879
June	85,497	51,411	68,426	42,453	17,071	8,958	95,339
July	69,184	43,128	55,120	35,787	14,064	7,341	75,252
Aug.	65,062	40,143	53,217	33,224	11,845	6,919	85,852
Sept.	76,063	46,469	60,209	38,619	15,854	9,850	82,274
Oct.	75,511	48,625	61,683	40,088	13,828	8,537	85,031
10 mo.	751,158	469,121	622,462	380,074	158,582	89,077	.....

Prices of Foundry Metals and Coke

(As of Jan. 25, 1960)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE

Connellsville	$18.00-18.50

OVEN

Birmingham	$30.35
Buffalo	32.00
Detroit	32.00
Erie, Pa.	32.00
Indianapolis	31.25
Kearny, N. J.	31.25
Milwaukee	32.00
Neville Island (Pittsburgh)	30.75
New England, deld.	33.55
New Haven, Conn.	31.00
Painesville, O.	32.00
Philadelphia	31.00
St. Louis	33.00
St. Paul	31.25
Swedeland, Pa.	31.00
Terre Haute, Ind.	31.25

PIG IRON

(Per gross ton, f.o.b. furnace)

	No. 2 Foundry	Malleable
Birdsboro, Pa.	$68.50	$69.00
Birmingham	62.50	66.50
Buffalo	66.50	67.00
Chester, Pa.	Nom.	Nom.
Chicago	66.50	66.50
Cleveland	66.50	66.50
Duluth	66.50	66.50
Erie, Pa.	66.50	66.50
Everett, Mass.	68.00	68.50
Fontana, Calif.	75.50	....
Geneva, Utah	66.50	....
Granite City, Ill.	68.40	68.90
Neville Island (Pittsburgh)	66.50	66.50
Swedeland, Pa.	68.50	69.00
Toledo, O.	66.50	66.50
Troy, N. Y.	68.50	69.00
Youngstown, O.	....	66.50

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 30.75; tin bronze, No. 225, 41.50; No. 245, 36.00; high-leaded tin bronze, No. 305, 35.25; No. 1 yellow, No. 405, 24.75; manganese bronze, No. 421, 29.25.

ALUMINUM: 99 per cent plus primary ingots 28.10. Secondary No. 12 alloy, 25.00-25.25. Deoxidizing grades: No. 1, 25.75; No. 4, 22.75.

MAGNESIUM: 99.8 per cent notched ingots 36.00, f.o.b. Velasco, Tex. (10,000 lb or more).

COPPER: Electrolytic 33.00, delivered Connecticut valley.

ZINC: High grade 14.25-14.50, delivered. Die casting alloy No. 3, 16.25-16.50; No. 2, 16.75-17.00, delivered.

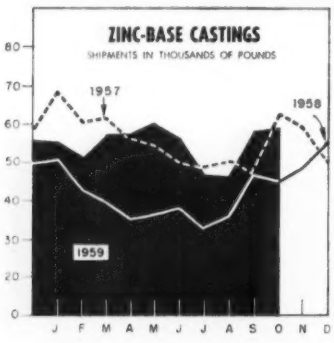
Iron and Steel Scrap

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Clean Auto Cast	Machinery Cast	Malleable	Short Steel Rails
Birmingham	$36.00-37.00	$53.00-54.00	.....	.....	.....	.....	57.00-58.00
Boston*	**37.00	**39.00-40.00	.....	.....	**40.00-42.00	.....	.....
Buffalo	37.00-38.00	**50.00	.....	.....	**51.00-52.00	.....	53.00-54.00
Chicago	42.00-44.00	55.00-56.00	.....	61.00-62.00	61.00-62.00	63.00-64.00	60.00-62.00
Cincinnati*	**36.00-37.00	**49.00-50.00	**44.00-45.00	.....	**59.00-60.00	.....	63.00-64.00
Cleveland	41.00-42.00	55.00-56.00	41.00-42.00	56.00-57.00	56.00-57.00	64.00-65.00	65.00-67.00
Detroit*	**37.00-38.00	**45.00-46.00	**39.00-40.00	**52.00-53.00	**39.00-40.00	.....	.....
Los Angeles*	40.00	47.00	.....	.....	.....	.....	.....
New York*	36.00-37.00	38.00-39.00	37.00-38.00	.....	.....	.....	.....
Philadelphia	42.00	43.00	47.00	.....	54.00-55.00	68.00	.....
Pittsburgh	42.00-43.00	50.00-51.00	.....	47.00-48.00	54.00-55.00	.....	64.00-66.00
St. Louis*	35.00-37.00	53.00	44.00	56.00	.....	.....	54.00
San Francisco	40.00	48.00	28.00	40.00	40.00	.....	.....
Seattle	35.00	34.00	28.00	.....	.....	.....	.....

*Brokers' buying prices. **F.o.b. shipping point

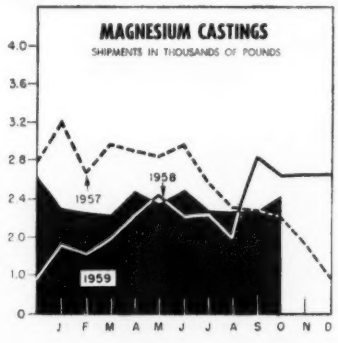
Foundry Statistics



PIG IRON

PRODUCTION—Net Tons

	Foundry	Malleable & Silvery	Low & Int. Low Phos. & Bessemer
1957	2,275,789	3,697,335	7,452,203
1958			
Nov.	175,210	257,131	489,095
11 mo.	1,468,303	2,210,184	4,568,075
Dec.	154,007	272,375	429,299
Totals[3]	1,622,320	2,448,917	4,954,854
1959			
Jan.	190,392	263,105	479,019
Feb.	121,716	258,250	312,284
Mar.	173,881	341,218	412,533
April	159,950	296,384	427,227
May	198,126	358,087	474,820
June	188,158	346,231	441,052
July	166,378	173,760	258,935
Aug.	.....	.....	.....
Sept.	.....	.....	.....
Oct.	.....	.....	.....
Nov.	148,660	180,927	216,063



ZINC-BASE CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1957	669,775	431,509	.....
1958			
Oct.	52,337	41,972	58,154
10 mo.	469,258	323,651	.....
Nov.	56,239	39,584	57,864
Dec.	64,574	46,236	56,756
Total	590,071	409,471	.....
1959			
Jan.	55,439	38,661	61,192
Feb.	51,368	35,478	57,437
Mar.	57,600	40,700	62,657
Apr.	57,325	40,127	55,916
May	60,656	43,920	62,224
June	56,128	40,226	54,097
July	46,756	34,606	52,677
Aug.	46,566	34,682	56,090
Sept.	58,144	40,397	60,953
Oct.	59,843	43,224	58,365
10 mo.	549,825	392,021	.....

CONSUMPTION*—Gross Tons

	Cupola	Air	Electric
1957	4,160,891	218,178	246,851
1958			
June	262,883	12,098	15,549
6 mo.	1,619,040	81,662	67,817
July	239,140	10,550	12,140
Aug.	247,428	13,196	32,309
Sept.	300,173	14,994	27,759
Oct.	300,115	17,393	34,273
Nov.	287,013	14,862	31,397
Dec.	321,741	16,610	25,450
Total	3,314,652	169,267	231,145
1959			
Jan.	321,302	17,113	36,783
Feb.	324,876	17,960	37,414
Mar.	353,985	20,625	42,464
Apr.	366,378	21,997	41,597
May	358,192	20,424	40,812
June	366,136	20,390	39,867
6 mo.	2,090,869	118,509	238,937

MAGNESIUM CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1957	30,322	28,452	.....
1958			
Oct.	2,747	2,422	5,463
10 mo.	23,216	20,166	.....
Nov.	2,754	2,552	4,063
Dec.	2,806	2,306	5,115
Total	28,776	25,024	.....
1959			
Jan.	2,291	2,086	5,001
Feb.	2,249	1,995	4,637
Mar.	2,129	1,924	4,465
Apr.	2,455	2,213	4,787
May	2,370	2,093	5,102
June	2,484	3,207	4,664
July	2,265	1,875	3,995
Aug.	2,243	1,753	3,809
Sept.	2,263	1,832	3,823
Oct.	2,436	1,890	3,501
10 mo.	23,185	20,868	.....

*Source: U. S. Dept. of Interior, Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For sale only. [3]Monthly figures do not add up to totals shown because of unreported monthly revisions.

Whitehead's
FINE SILICA SANDS
for Fine Finish Castings and Shell Molding

Whitehead offers the widest variety of fine washed and unwashed silica sands . . . all laboratory-tested in a Whitehead laboratory in each of the areas represented.

DIVIDING CREEK, New Jersey
Fine Washed Silica Sands

Retained on Sieve #	Grade D #71	Grade D Special #75	Grade E #96	Grade Overflow #118	Grade Superior #158
30	none	none	none	none	none
40	2.0	1.0	1.0	.2	.2
50	9.8	4.8	7.6	3.2	1.8
70	26.4	14.0	20.4	13.2	4.6
100	41.0	40.2	31.8	29.0	11.2
140	15.0	29.8	17.2	20.2	22.4
200	4.4	8.2	10.8	15.4	25.6
270	.8	1.2	5.6	8.8	14.0
Pan	.6	.8	5.6	10.0	20.2

McCONNELLSVILLE, New York
Fine Unwashed Silica Sands

Retained on Sieve #	#103	#130	#155	#180	#230	#275
30	.3	.2	none	none	none	none
40	.5	.2	.4	"	"	"
50	4.2	.4	1.4	"	.2	"
70	13.6	1.6	3.2	.4	.2	.2
100	26.1	12.4	10.2	2.5	.4	.6
140	25.7	32.8	22.0	18.0	4.0	1.2
200	20.8	37.2	30.0	35.9	21.4	6.4
270	5.5	9.8	14.2	17.4	21.4	11.2
Pan	3.3	5.4	16.8	23.8	46.4	80.4
Very Fine	none	none	1.8	2.0	6.0	

NEW ENGLAND
Marion Fine Washed Silica Sand AFSF #105

Sieve #	Retained
+6	none
12	"
20	"
30	"
40	.6
50	1.4
70	6.0
100	30.6
140	34.4
200	19.2
270	4.6
Pan	3.2

BLANEY, SOUTH CAROLINA
Washed Silica Sands

	55 B (50 — 60)	65 B (60 — 70)	80 B (70 — 95)	140 B (130 — Plus)	120 B (110— 135)
30	3.6	.4			
40	14.0	3.8	1.0		.5
50	27.7	15.6	6.6	.2	3.4
70	28.7	29.4	21.0	1.4	11.2
100	18.1	28.6	32.8	8.0	20.4
140	6.8	16.2	27.0	24.6	25.8
200	1.0	4.2	8.4	28.4	18.2
270	.1	1.4	2.4	21.8	12.1
Pan		.4	.8	15.6	8.2
AFS	51	68	82	161	121

LEADER IN FOUNDRY SANDS SINCE 1841

Whitehead Brothers COMPANY

Established 1841

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324 West 23rd St., New York 11, N. Y.

NEW ENGLAND OFFICE
75 Westminster St., Providence 1, R. I.

Manufacturers of:

LYQUAGRIP
Ready-to-use core paste

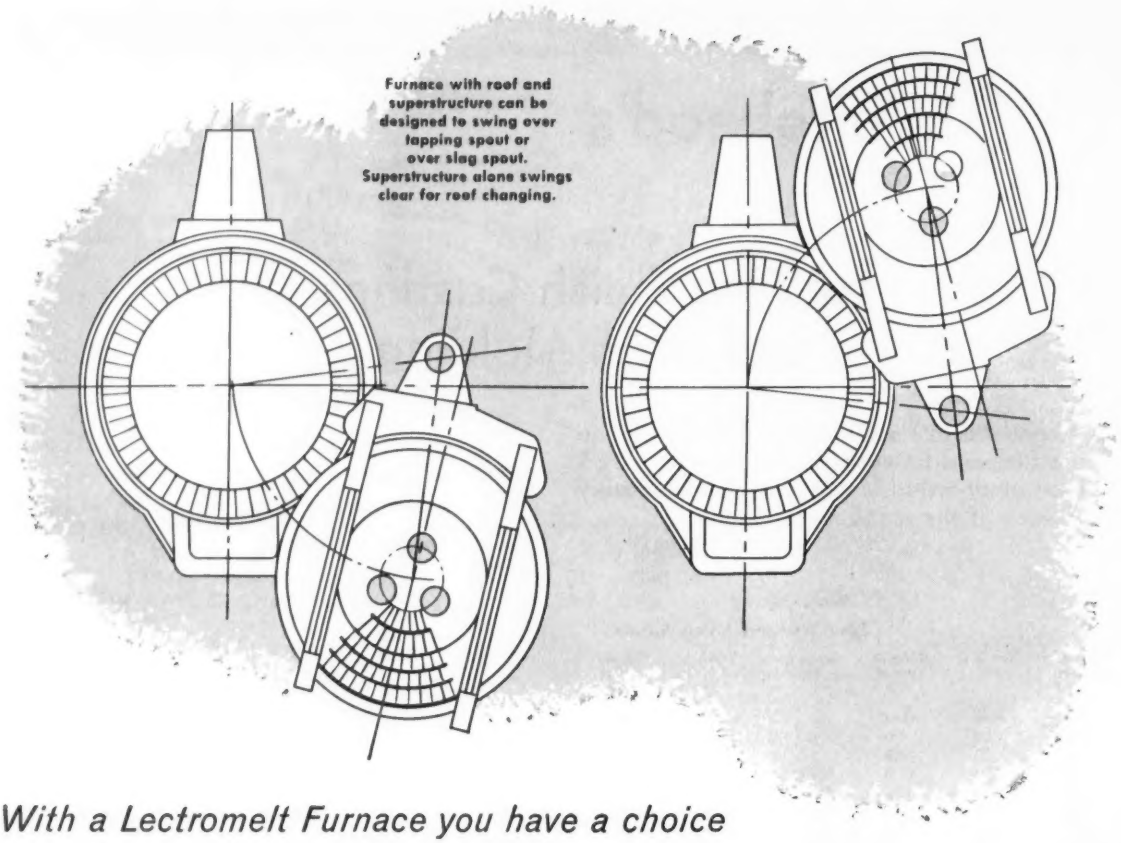
DUO RESIN
Binder for baking with controlled oven temperatures

JOINT-SEAL
Plastic compound for perfect sealing

LYQUAFLOUR
For cleaner surface, better shakeout

LYQUAFACE
The liquid sand grain coating

Circle 579 on Page 53


Furnace with roof and superstructure can be designed to swing over tapping spout or over slag spout. Superstructure alone swings clear for roof changing.

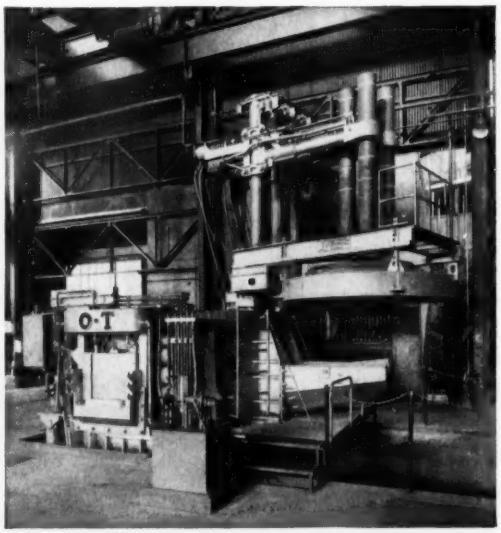
With a Lectromelt Furnace you have a choice

THE ROOF CAN BE BUILT FOR FRONT OR BACK SWING

SELECT the direction of swing that best fits your plant layout—over the tapping spout or over the slag spout. Lectromelt's design and method of separately supporting the roof structure makes this possible. You profit by the greater efficiency and convenience that result.

Note in the above drawing how the furnace top swings clear of the furnace; there's no interference with the charging bucket to slow down the charging operation. Lectromelt places the pivot point away from the furnace shell to accomplish this. And, because the swing of the top can be less, there's less strain on the conductors.

Catalog No. 10 describes Lectromelt furnaces. For a copy write Lectromelt Furnace Division, McGraw-Edison Company, 314 32nd Street, Pittsburgh 30, Pennsylvania.



Lectromelt®

McGRAW EDISON

CANADA: Wild-Barfield Electric Furnaces, Ltd., Toronto . . . ITALY: Forni Stein, Genova . . . ENGLAND: G.W.B. Furnaces Limited, Dudley, Worcs. . . . GERMANY: Demag-Elektrometallurgie, GmbH, Duisburg . . . SPAIN: General Electrica Espanola, Bilboa . . . FRANCE: Stein et Roubaix, Paris . . . BELGIUM: S. A. Stein & Roubaix, Bressoux-Liege . . . JAPAN: Daido Steel Co., Ltd., Nagoya

STANDARD SIZES UP TO TWO HUNDRED TONS CAPACITY

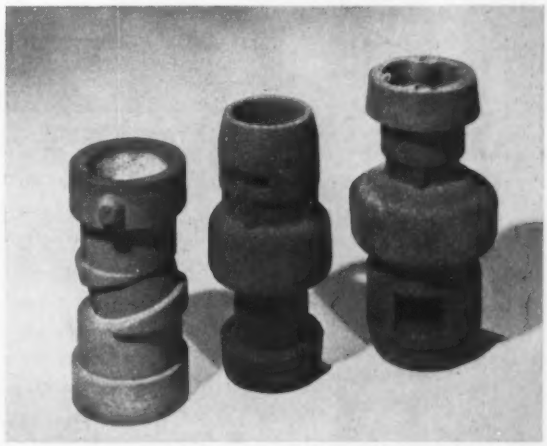
Circle 580 on Page 53

NOW AMRES 1511

3 new and vastly superior
FOUNDRY RESINS
from American-Marietta
... including

Fastest water-borne one-step Phenolic Resin ever developed!

AMRES 1511 is ideal where production speed is vital in hot process sand coating or cold coating equipment with external hot air. Although no sand preheating is required, preheated sand may be used. Its extreme fast cure rate gives excellent tensile strengths without danger of fire or explosion. This remarkable new phenolic resin is now available for fast delivery from shipping points throughout the country.



AMRES 4170 is a new novolac (two-step) resin developed especially for hot sand coating equipment. It may be used in a direct-flame muller without fire, explosion or over-reaction risk. AMRES 4170 has an infinitely stable storage life.

AMRES 4196 (novolac) is perfect where muller heat input is limited. It is excellent in a low volume operation or where coating cycles are not critical. It also has a infinite storage life.

Send coupon today for complete data on these three great new American-Marietta Resins–AMRES 1511–AMRES 4170 and AMRES 4196

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AMERICAN-MARIETTA COMPANY

ADHESIVE, RESIN AND CHEMICAL DIVISION
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for Your Progress Tomorrow

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Title ..... *Dept* .....
Company .....
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Circle 581 on Page 53

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"SEMI-STEEL"
STEEL TYPE ABRASIVES
cost you only

$155.00 *per ton*

Beach wear by Jantzen

There's no need to pay a premium for small quantity orders of steel abrasives. METAL BLAST sells its "SEMI-STEEL" for a flat $155 per ton — in any quantity, one ton to a carload. (Prompt shipment, too, on any size order!)

You save, therefore, on material cost alone, from $50 to $100 a ton! But, that's not all! "SEMI-STEEL" cleans as well or better than other, higher priced steel abrasives. It lasts just as long. Easier on equipment, too, so your maintenance costs are lower. You just can't help but slash cleaning costs. And, we'll guarantee it — in writing!

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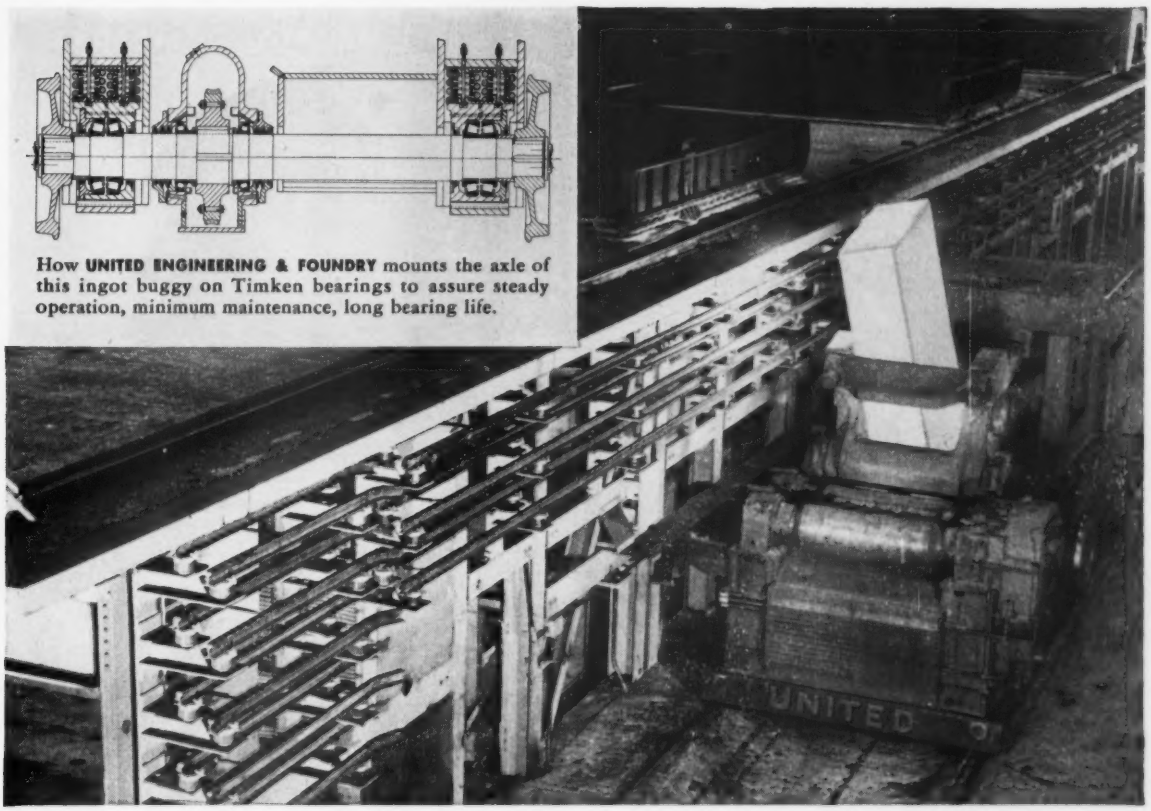
How **UNITED ENGINEERING & FOUNDRY** mounts the axle of this ingot buggy on Timken bearings to assure steady operation, minimum maintenance, long bearing life.

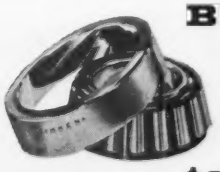


Keeps hot slabs moving fast with 27 Timken® bearings to keep it rolling

THIS United ingot buggy moves hot slabs and keeps 'em moving fast from a major steel producer's slab mill. To make sure the buggy moves the heavy loads steadily, with minimum maintenance, its builders, United Engineering & Foundry, equipped it with 27 Timken® *tapered* roller bearings. They're used on the axle drive worm shaft, axle journals, worm gear tilting drive worm shaft and tilting drive pinion shaft.

Timken bearings keep shafts aligned, gears meshing accurately. The tapered design of Timken bearings enables them to take any combination of radial and thrust loads. And full-line contact between rollers and races provides maximum stability. Cost-saving results are: shafts are held rigid; gears mesh smoothly and accurately; shaft wear is eliminated; gear wear reduced.

Any machine with Timken bearings gives you *extra* benefits—the benefits of Timken Company leadership in tapered roller bearing design and in engineering service. It's leadership backed by the most modern research and development facilities in the bearing industry. To get the most out of the machines you build or buy, specify Timken bearings. ***When you buy Timken bearings you get . . .*** *1) Quality you can take for granted. 2) Service you can't get anywhere else. 3) The best-known name in bearings. 4) The pace setter in lower bearing costs.* The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO". *Makers of Tapered Roller Bearings, Fine Alloy Steels and Removable Rock Bits.*

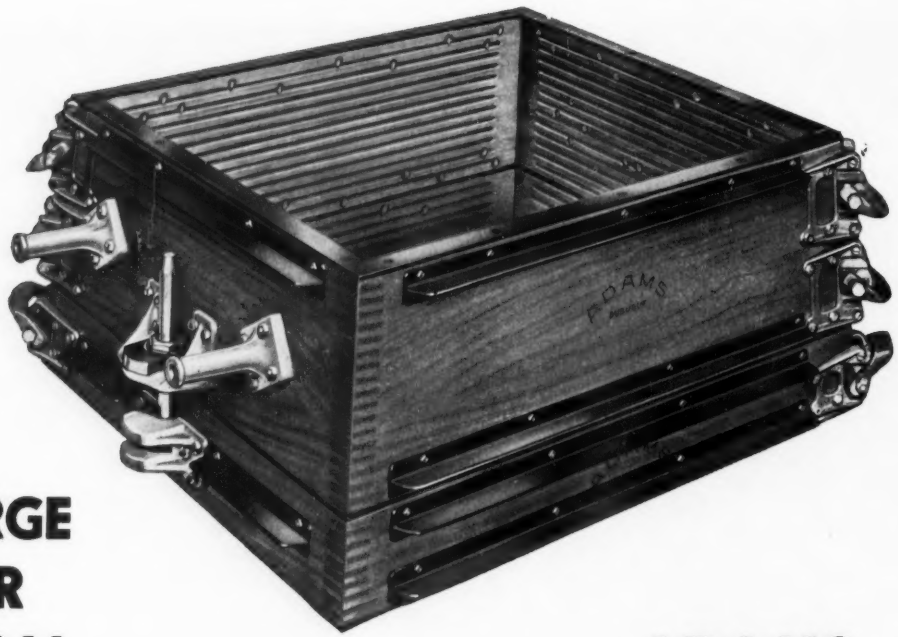


BETTER-NESS rolls on

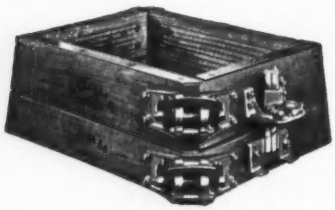
TIMKEN®

tapered roller bearings

Circle 583 on Page 53



LARGE OR SMALL



Patent No. 2393200
Other Patents Pending

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EASY-OFF FLASK

PIN AND EAR ARRANGEMENT SUPPLIED TO SUIT YOUR PRESENT PATTERN PLATE GUIDES

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ADAMS CHERRY EASY-OFF FLASKS

with ADAMS JACKETS

CAST IRON OR ALUMINUM

To Complete
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ESTABLISHED 1883

MOLDING MACHINES and FLASK EQUIPMENT

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Nationwide Network of Local Service Centers!

Wherever they are, users of Towmotor-Gerlinger fork lift trucks and carriers know that the industry's fastest service is as handy as a phone call. It's one of the reasons why industrial firms have invested millions of dollars in Towmotor-Gerlinger equipment.

Over 90% of parts are replaced off the shelf at local service centers —others within 24 hours! Prompt repairs are made by service experts. Even engine overhauls are treated like emergencies to maintain Towmotor's reputation for *Continuous Operation.* This is aided also by Towmotor Preventive Maintenance Service *which actually averts downtime, prevents wear, cuts repair bills and keeps equipment on the job around the calendar!*

Want more information on this unique Towmotor service? Ask for *Towmotor P-M Service Booklet SP-18.* Write Towmotor Corporation, Cleveland 10, Ohio.

Find Your Nearest Distributor In The 'Yellow Pages'

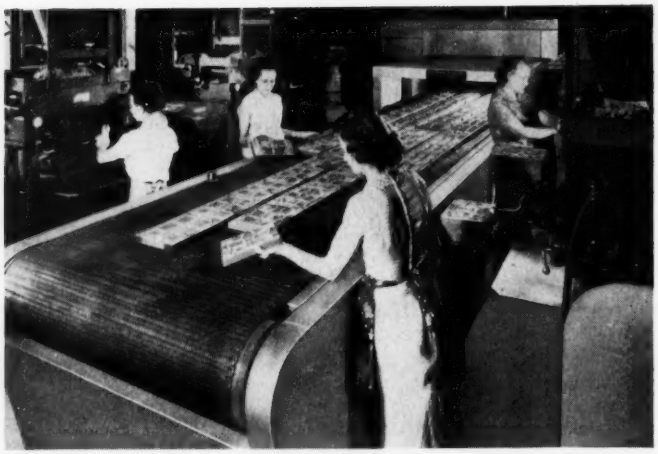
TOWMOTOR THE ONE-MAN-GANG ® **-GERLINGER**

LEADER FOR 40 YEARS IN BUILDING FORK LIFT TRUCKS, CARRIERS AND TRACTORS

*Gerlinger Carrier Co. is a subsidiary of Towmotor Corporation

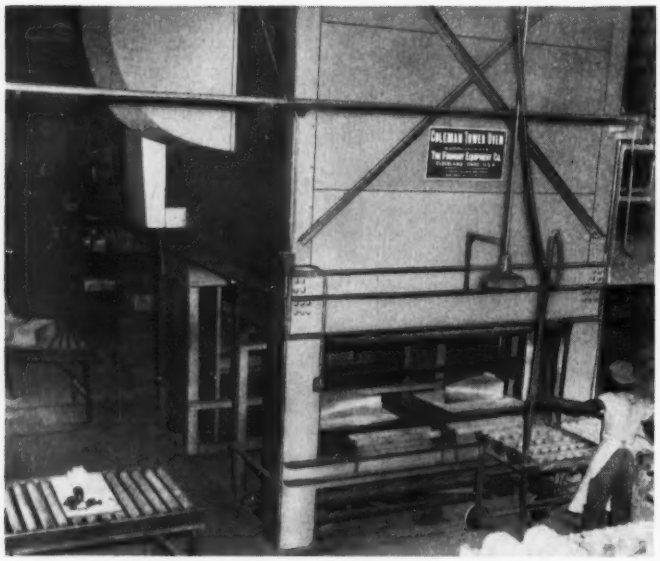
Circle 585 on Page 53

CUT LABOR COSTS with



Coleman Dielectric Core Oven in leading plumbing fixture foundry. Direct labor alone reduced by 75%, with many other important savings and advantages.

Coleman Conveyor Core Ovens



One of two large Coleman Tower® Core Ovens in a major steel foundry baking cores up to 150 pounds. Self-amortizing investment . . . ovens paid for themselves out of direct annual savings in less than two years.

● Performance records in all types of foundries prove that Coleman Conveyor Core Ovens reduce core department costs by as much as 50%.

Coleman Ovens quickly pay for themselves out of direct savings in labor, materials and reduced casting scrap.

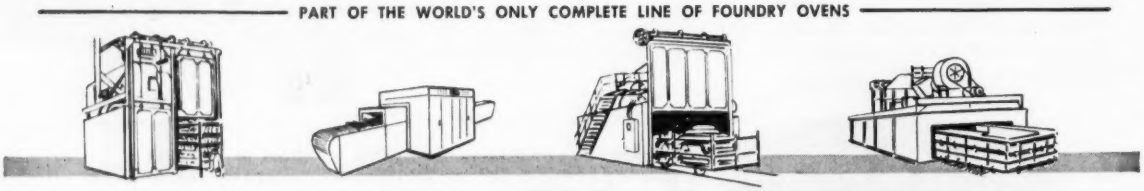
As builders of the world's only complete line of foundry ovens . . . dielectric or recirculating heat . . . we can recommend, without bias, the right oven for your particular needs.

WRITE FOR BULLETIN 54

THE FOUNDRY EQUIPMENT COMPANY • **1821 COLUMBUS ROAD, CLEVELAND 13, OHIO**

World's Oldest and Largest Foundry Oven Specialists—More than half a century of specialized foundry experience.

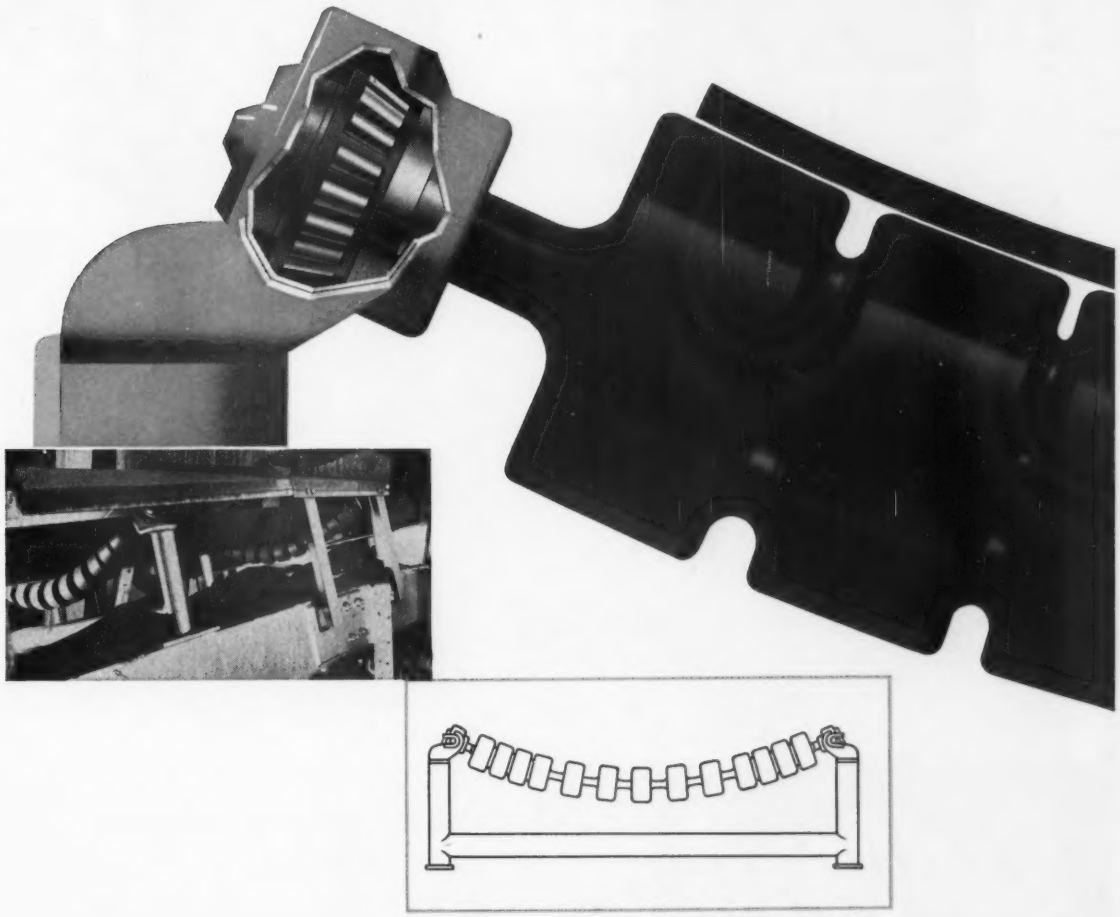
PART OF THE WORLD'S ONLY COMPLETE LINE OF FOUNDRY OVENS



TRANSRACK OVENS **DIELECTRIC CORE OVENS** **CAR TYPE OVENS** **JET ACTION MOLD OVENS**

Circle 586 on Page 53

Bearing Location is the Key to Long Service Life



JOY LIMBEROLLER® CONVEYOR IDLERS

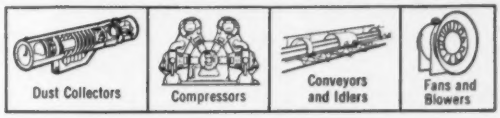
Joy Limberoller Conveyor Idlers give many times the normal service life, because the two bearings rest in slots in the support brackets—well away from spillage. On conveyor lines carrying ore, limestone, and other abrasive materials, Limberollers have given more than ten times the service life of steel idlers.

Limberoller Idlers consist of a neoprene coated wire rope to which are moulded neoprene discs. The ends of the rope turn in sealed bearings. This design not only eliminates clogging and freezing of the bearings, but also makes the idlers easy to service—they can be replaced while the belt is moving.

Limberollers are economical, not only because of long service life, but also because they can be spaced further apart than steel idlers. They are corrosion and flame resistant, self-cleaning, and eliminate the "bump" typical of steel idlers.

For complete details, write for Bulletin 963-13.

EQUIPMENT FOR ALL INDUSTRY

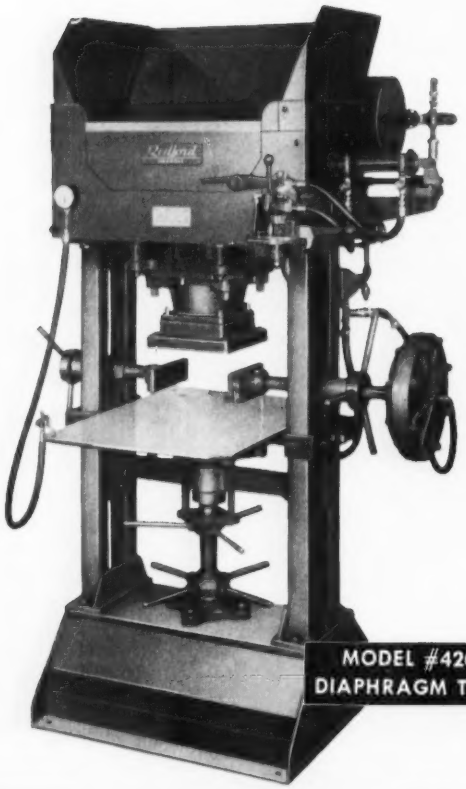


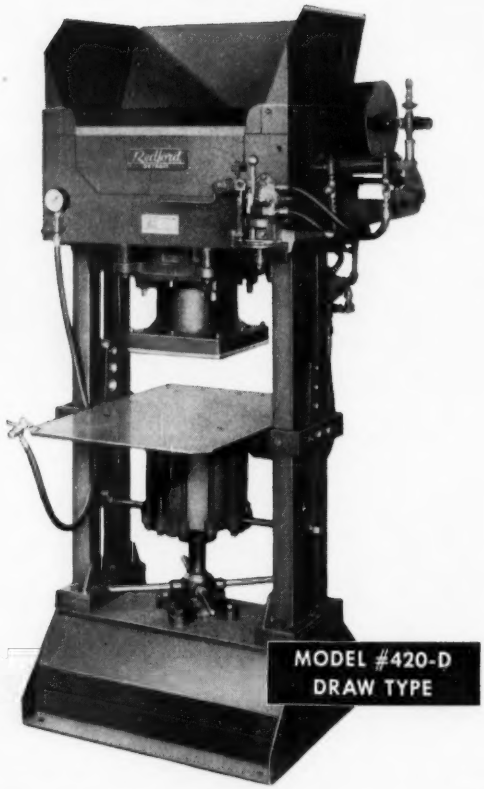
JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

Circle 587 on Page 53





Redford CORE BLOWER AND CORE SHOOTER

Here is a core making machine that is setting new standards in versatility and performance. The #420 Redford is equipped *to make cores up to 20 lbs. using any type binder.* Proven core blowing practices may be continued to do the most intricate work and to assure maximum production. Tough sand mixes which do not readily lend themselves to blowing can be used in ramming or shooting cores.

Core shooting requires a fast acting machine having sufficient capacity to propel sand at high velocity through a large shoot head opening. The large shoot head opening offers little resistance to the flow of sand and allows any sand to be rammed into suitable open cavity core boxes ahead of the propelling air.

With the #420 Redford we offer a tool that allows you the widest choice of application. It is a properly balanced combination of standard Redford practices that makes possible a low cost machine of greater usefulness and versatility to meet today's core room requirements.

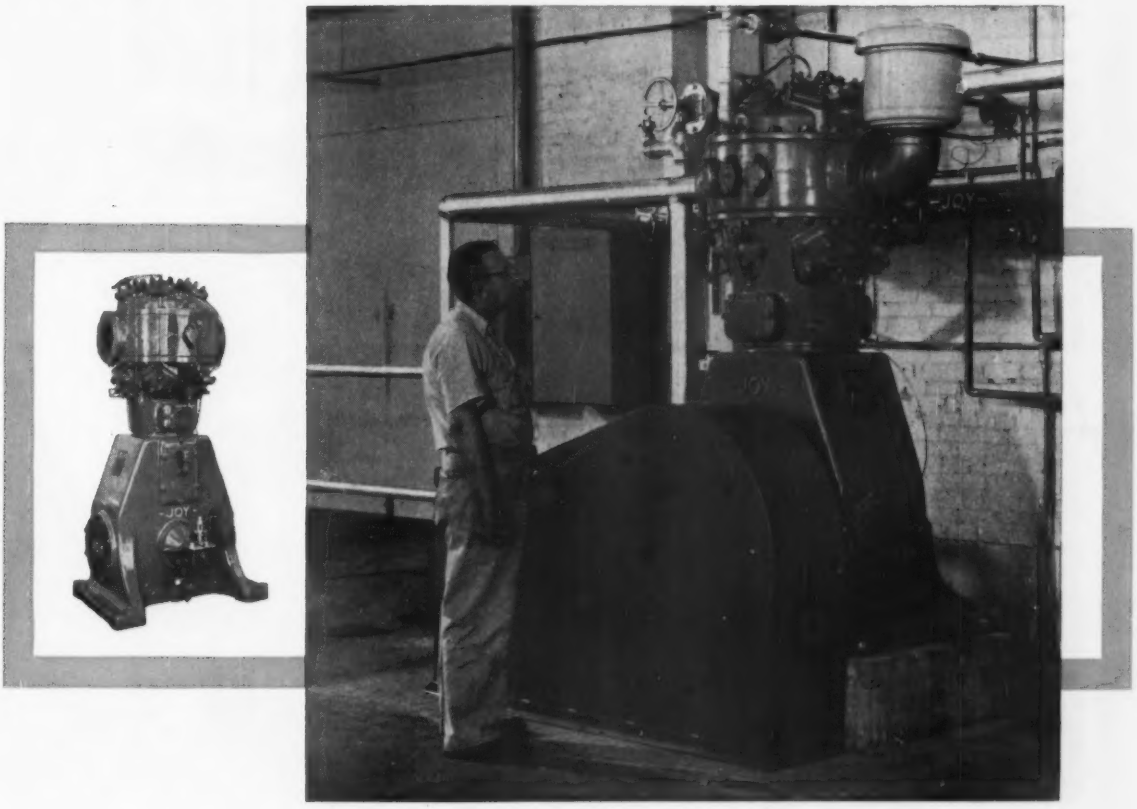
Redford IRON & EQUIPMENT CO.
20733 Glendale • Detroit 23, Michigan
Phone: KEnwood 1-8611

For Complete Information write for
BULLETIN #42

Circle 588 on Page 53

Now Available Up To 150 HP

NEW JOY WG9H VERTICAL COMPRESSORS



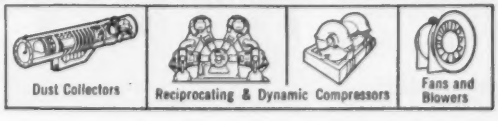
Joy's line of highly efficient vertical type compressors has been extended to 150 hp. These new heavy duty WG9H's have the same design features which established the vertical type, single-cylinder compressor's reputation for high efficiency and low maintenance.

You can get both standard and oil-free machines in six standard atmospheric air sizes, with appropriate cylinders for gas boosting and high pressure applications, if desired. Capacity range is from 633 to 1630 cfm.

Other Joy vertical type compressors are available in a range from 15 to 75 hp. Joy also can furnish V-type and semi-radial type machines up to 1250 hp, and axial or centrifugal compressors from 15 to 15,000 hp. Whatever your air or gas compressing problems may be, Joy can supply an economical solution.

For full information on the new line of WG9H Compressors, write for Bulletin 1013-13.

AIR MOVING EQUIPMENT FOR ALL INDUSTRY



JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

Circle 589 on Page 53

End jar-caused maintenance with TABOR-SHOCKLESS FULL-POWER JOLT

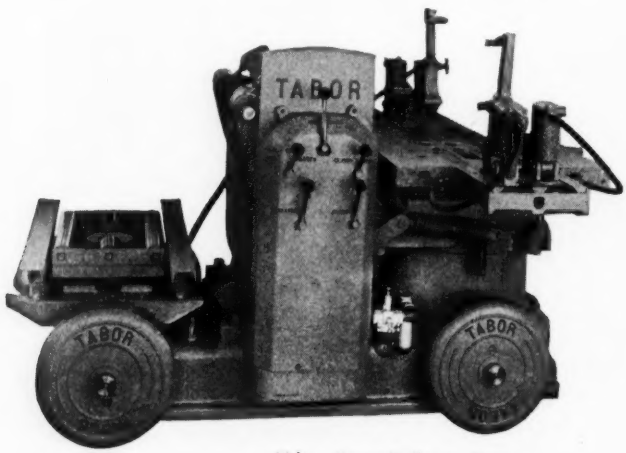
Earthquake shocks that used to be a necessary evil in foundry (particularly core-room) operation can now be avoided without loss of full-power jolt. It's the Tabor-shockless principle that does the trick.

The Tabor Power-Rollover, Power-Draw Machine shown here gives full ramming effect on the sand . . . with shock divided between the falling table and the rising anvil. Reduces costly maintenance on the machine itself, and on surrounding equipment.

If you want all your equipment to last longer, work better, find out about the Tabor-shockless principle today. Write for Tabor literature or ask to see the Tabor man — the technical man.

THE TABOR MANUFACTURING CO.
Division of Turbo Machine Company
LANSDALE, PA.

PROOF!
that a full-power jolt can be completely shockless. A quarter placed on edge on the base of a Tabor-Shockless Machine remains standing even after full-power jolt.



Tabor Power-Rollover, Power-Draw Machine with completely shockless full-power jolt.

TM

THE TABOR MAN
IS A TECHNICAL MAN

TM

TABOR

Circle 590 on Page 53

OLDEST KNOWN DIETERT-DETROIT SAND STRENGTH UNIT

Dietert-Detroit Serial No. 2048 strength machine tested green compression and shear strength only

RETIRED

after **30** years

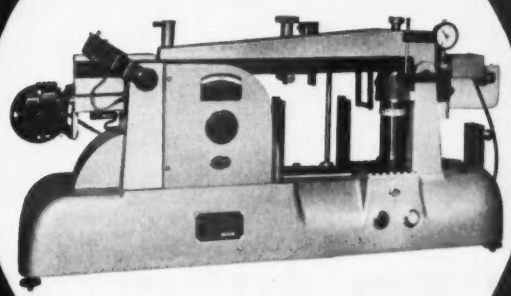
Harry W. Dietert Co. recently conducted a contest to find the oldest Dietert-Detroit Sand Strength Machine in daily use. 157 foundries reported on a total of 164 old-timers in the 20 to 30 year life range. The unit shown at left bears serial No. 2048. It was sold in 1928, was discovered at Clio Foundry, Clio, Michigan, in daily use, and going strong—attesting to the strength, durability and accuracy of foundry testing equipment bearing the Dietert name.

REPLACED

in **30** minutes

Harry W. Dietert Co. reserved the right to retire the 30-year unit, while Clio Foundry received as first prize a new Model 405 Dietert-Detroit Universal Sand Strength Machine. Operating instructions were transmitted in 30 minutes. *Write now for details.*

MODEL 405
DIETERT-DETROIT
Universal Sand Strength Machine



Greater capacity, sensitivity, and accuracy than any other instrument of its kind.

tests...

MOLDING SANDS
(a) Green Compression
(b) Dry Compression
(c) Green Shear
(d) Dry Shear
(e) Green Tensile
(f) Deformation
(g) Toughness

CORE SANDS
(a) Green Compression
(b) Baked Tensile
(c) Baked Transverse
(d) Baked Transverse Deflection

SHELLS
(a) Tensile Strength
(b) Transverse Strength

HARRY W. DIETERT CO.

9330 Roselawn, Detroit 4, Mich.

Gentlemen:

Send me facts on the No. 405 Dietert-Detroit Universal Sand Strength Machine.

Name_____

Title_____

Company_____

Address_____

City_____ Zone_____ State_____

Circle 591 on Page 53

Enthusiasm is no substitute

It's no sin to be enthusiastic.

But it takes experience to get uniformly satisfactory results.

It's the experience we've picked up in over a quarter-century making metal abrasives that pays off for our customers.

We were the first to produce steel shot and grit on a tonnage basis in this country. Our engineer-salesmen, through the years, have run into just about every cleaning problem that has ever come up. They know cleaning equipment. Further, they know what long-lived quality abrasives will do — in fast cleaning. And if they don't know the answer to a given problem, right off, one of our metallurgists will take a flying trip to your plant, with the answers.

So, whether it's brass, aluminum, or steel that you're dealing with, whether it's slab, sheet, heat-treated parts, forgings or castings, one of our abrasives will do the job for you — when it's properly applied.

Let us show you what AMASTEEL, AMABRASIVE, ENAMA-STEEL, ALECTRA shot and grit can do in your cleaning room. Our engineer-salesman has a portable testing ma-

for Experience!

chine which will test-prove our product right before your eyes, in your plant.

If you're worried about production losses because shipments are late, count on us. We stockpile finished and unfinished shot and grit in a variety of hardnesses and sizes. It's here, ready for shipment to you on a rush order basis.

Want to know about the most complete selection of abrasives ever offered? Write for our Catalog No. 591.

AMASTEEL

the man from Alloy Metal

ALLOY METAL ABRASIVE COMPANY
121 South Division Street
Ann Arbor, Michigan

Circle 592 on Page 53

Raw Materials Handling In Medium Size Foundry

Tramrail Crane Handles 80 to 90 Tons Per Day

ALL materials required for the charging of cupolas in the Heavy Foundry of Standard Foundry Company, Worcester, Mass., are handled by a 3-ton, 3-runway, 64'-0" long cab-operated Cleveland Tramrail crane with a 36 inch magnet. From 40 to 45 tons are put in the large storage bins per day. The same crane delivers the materials from the storage bins to the hoppers in the charge accumulation area.

The crane is part of a more extensive Cleveland Tramrail system, all of which has been in service for 12 years. The crane is busy 12 hours a day and operates on a 130'-0" long runway at 300 f.p.m. Hoist speed is 50 f.p.m.

Standard Foundry produces meehanite castings which range in sizes up to 10 tons and are used mostly for machine tools of the fine machine-tool builders in the vicinity.

Incoming raw materials are taken to the large storage bins in the foreground by the Cleveland Tramrail magnet-handling crane. The same crane fills a series of hoppers, seen in the rear, in the charge-gathering area.

CLEVELAND TRAMRAIL

Overhead Materials Handling Equipment

Write for free booklet 2008

CLEVELAND TRAMRAIL DIVISION • THE CLEVELAND CRANE & ENGINEERING CO. • 3847 E. 286 ST. • WICKLIFFE, OHIO

Circle 593 on Page 53

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- For more information on anything advertised in this issue
- For further data on products described in the Equipment and Supplies section (Page 113)
- To get copies of publications listed in the Literature for Foundrymen section (Page 175)
- To request extra copies of editorial articles

FOUNDRY FEBRUARY 1960

401	431	461	491	521	551	581	611	641	671	701	731	761	791	821	851
402	432	462	492	522	552	582	612	642	672	702	732	762	792	822	852
403	433	463	493	523	553	583	613	643	673	703	733	763	793	823	853
404	434	464	494	524	554	584	614	644	674	704	734	764	794	824	854
405	435	465	495	525	555	585	615	645	675	705	735	765	795	825	855
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407	437	467	497	527	557	587	617	647	677	707	737	767	797	827	857
408	438	468	498	528	558	588	618	648	678	708	738	768	798	828	858
409	439	469	499	529	559	589	619	649	679	709	739	769	799	829	859
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411	441	471	501	531	561	591	621	651	681	711	741	771	801	831	861
412	442	472	502	532	562	592	622	652	682	712	742	772	802	832	862
413	443	473	503	533	563	593	623	653	683	713	743	773	803	833	863
414	444	474	504	534	564	594	624	654	684	714	744	774	804	834	864
415	445	475	505	535	565	595	625	655	685	715	745	775	805	835	865
416	446	476	506	536	566	596	626	656	686	716	746	776	806	836	866
417	447	477	507	537	567	597	627	657	687	717	747	777	807	837	867
418	448	478	508	538	568	598	628	658	688	718	748	778	808	838	868
419	449	479	509	539	569	599	629	659	689	719	749	779	809	839	869
420	450	480	510	540	570	600	630	660	690	720	750	780	810	840	870
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422	452	482	512	542	572	602	632	662	692	722	752	782	812	842	872
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425	455	485	515	545	575	605	635	665	695	725	755	785	815	845	875
426	456	486	516	546	576	606	636	666	696	726	756	786	816	846	876
427	457	487	517	547	577	607	637	667	697	727	757	787	817	847	877
428	458	488	518	548	578	608	638	668	698	728	758	788	818	848	878
429	459	489	519	549	579	609	639	669	699	729	759	789	819	849	879
430	460	490	520	550	580	610	640	670	700	730	760	790	820	850	880

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402 432 462 492 522 552 582 612 642 672 702 732 762 792 822 852
403 433 463 493 523 553 583 613 643 673 703 733 763 793 823 853
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414 444 474 504 534 564 594 624 654 684 714 744 774 804 834 864
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417 447 477 507 537 567 597 627 657 687 717 747 777 807 837 867
418 448 478 508 538 568 598 628 658 688 718 748 778 808 838 868
419 449 479 509 539 569 599 629 659 689 719 749 779 809 839 869
420 450 480 510 540 570 600 630 660 690 720 750 780 810 840 870
421 451 481 511 541 571 601 631 661 691 721 751 781 811 841 871
422 452 482 512 542 572 602 632 662 692 722 752 782 812 842 872
423 453 483 513 543 573 603 633 663 693 723 753 783 813 843 873
424 454 484 514 544 574 604 634 664 694 724 754 784 814 844 874
425 455 485 515 545 575 605 635 665 695 725 755 785 815 845 875
426 456 486 516 546 576 606 636 666 696 726 756 786 816 846 876
427 457 487 517 547 577 607 637 667 697 727 757 787 817 847 877
428 458 488 518 548 578 608 638 668 698 728 758 788 818 848 878
429 459 489 519 549 579 609 639 669 699 729 759 789 819 849 879
430 460 490 520 550 580 610 640 670 700 730 760 790 820 850 880

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FOUNDRY

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FIRST CLASS
Permit No. 36
CLEVELAND, OHIO

BUSINESS REPLY MAIL
No Postage Stamp Necessary If Mailed In the United States
—POSTAGE WILL BE PAID BY—

FOUNDRY
Penton Building
Cleveland 13, Ohio

Reader's Service Dept.

FIRST CLASS
Permit No. 36
CLEVELAND, OHIO

BUSINESS REPLY MAIL
No Postage Stamp Necessary If Mailed In the United States
—POSTAGE WILL BE PAID BY—

FOUNDRY
Penton Building
Cleveland 13, Ohio

Reader's Service Dept.

RESTORE COSTLY COPPER COMPONENTS TO FULL EFFICIENCY at a fraction of replacement cost

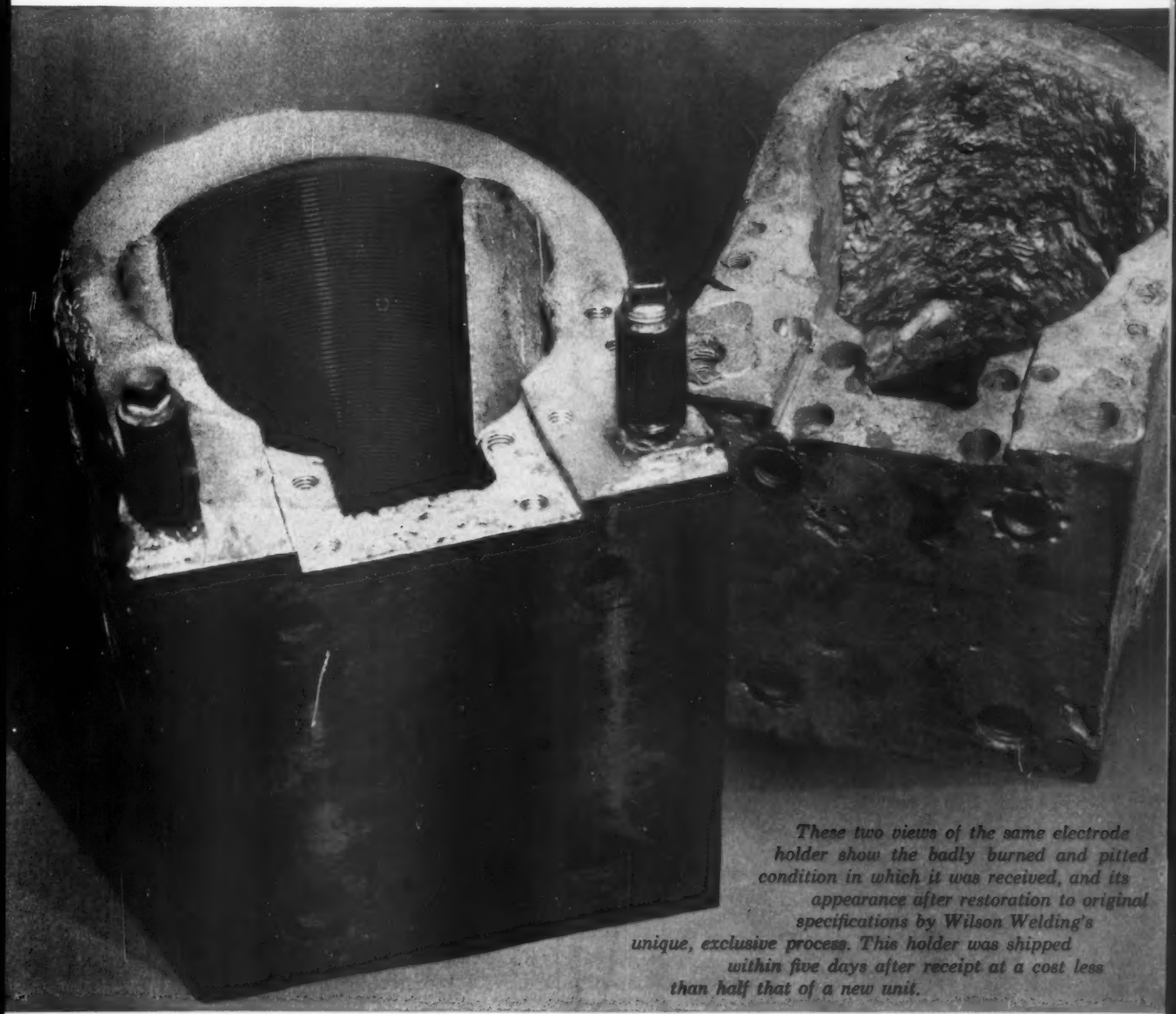
ELECTRODE HOLDERS, BUS TUBES, CABLE CLAMPS, TUYERES

Foundry operators throughout the industry are saving literally thousands of dollars by taking advantage of Wilson Welding Company's patented process for rebuilding costly copper electrode holders, bus tubes, cable clamps and tuyeres.

After being restored to original specifications, or modified to meet your requirements, such items are guaranteed to perform and give life expectancy equal to that of new units and at substantial savings. Repair prices are based upon the amount of labor and material cost involved and rarely equal 50 per cent of replacement cost.

Prompt service reduces costly down time. Ordinarily jobs are completed and shipped within five days after receipt. In emergencies this service can be accelerated to meet your requirements.

Don't discard or scrap badly burned, pitted or scarred units. They are costly and can be salvaged. Write or call Wilson Welding Company, Inc. for cost estimate or additional information without obligation.



These two views of the same electrode holder show the badly burned and pitted condition in which it was received, and its appearance after restoration to original specifications by Wilson Welding's unique, exclusive process. This holder was shipped within five days after receipt at a cost less than half that of a new unit.

WILSON WELDING COMPANY, INC.

COPPER AND COPPER ALLOY WELDING

Now serving 200 steel mills and foundries throughout the United States and Canada

P. O. BOX 1634
221 HIGH STREET
ALTIZER ADDITION
HUNTINGTON, W. VA.
JACKSON 3-6281

Circle 594 on Page 53

Announcing

A SPECIAL REPORT

The Dynamic Metal Casting Industries

MEET THE CHALLENGE OF THE SOARING 60s

AN EDITORIAL PRESENTATION
IN FOUR SECTIONS

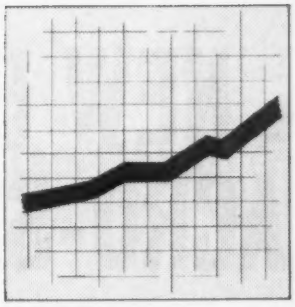
The editors of FOUNDRY announce plans for another special report to the metal casting industries. This year's contribution to foundry planning is designed to help foundrymen share in the opportunities of the long-heralded decade of the Soaring Sixties. It will appear in the May, 1960, Pre-Convention issue of FOUNDRY to be published immediately prior to the 64th Castings Congress and Foundry Exposition of the American Foundrymen's Society (Philadelphia, May 9-13).

It's COMING - - - a truly outstanding FOUNDRY editorial package

MAY 1960 PRE-CONVENTION ISSUE

1. WHAT ARE FOUNDRYMEN PLANNING?

A report of an intensive study of foundry equipment purchases planned for the next two years will be made. Plant expansion projects by metal casting companies are an important part of this picture, and they, too, will be reported. Foundries, large and small, will be included in this report, which will be of unusual interest as an indication of the manner in which foundrymen are gearing up for tomorrow's production requirements.

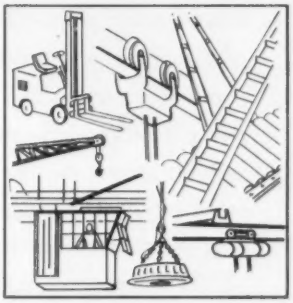


2. INVENTORY OF FOUNDRY EQUIPMENT

FOUNDRY's editors and market research staff have joined forces to make this special study. (This inventory is conducted every five years.) It includes 65 different types of equipment in ten major categories. Use of equipment in different types and sizes of foundries, relative age of equipment, and other pertinent data will, as always, be of considerable interest to foundrymen—and to equipment makers whose function it is to fill metal caster's needs.

3. WHEN SHOULD FOUNDRYMEN PURCHASE EQUIPMENT?

Much has been written and spoken on this vital question. The editors have studied existing information and opinions on the subject and will present recommendations of equipment manufacturers to foundrymen. Attention will be given to the needs of the small plant as well as to those of the large producer.



4. WHAT FOUNDRIES CAN GAIN BY MODERNIZING

Modernization and mechanization of castings production equipment has been going on for many years. Now foundrymen are paying special attention to this avenue to increased profits. Indications are that the 60s may truly be just the beginning of real modernization of facilities. The editors have chosen appropriate case histories of plants which *have* modernized successfully for presentation in this year's special editorial package.

Plus... **The May Pre-Convention issue will carry program details on the Philadelphia Convention in addition to regularly scheduled features. It will be mailed to reach foundrymen well in advance of the convention.**

BUSINESS MAGAZINE OF THE DYNAMIC METAL CASTING INDUSTRIES

FOUNDRY
A PENTON PUBLICATION

Penton Building, Cleveland 13, Ohio

NEW ELPAR ACRO-SMOOTH

with these most wanted features...

- **Smooth stepless speed control**
- **Easy, low cost maintenance**
- **Increased work output**

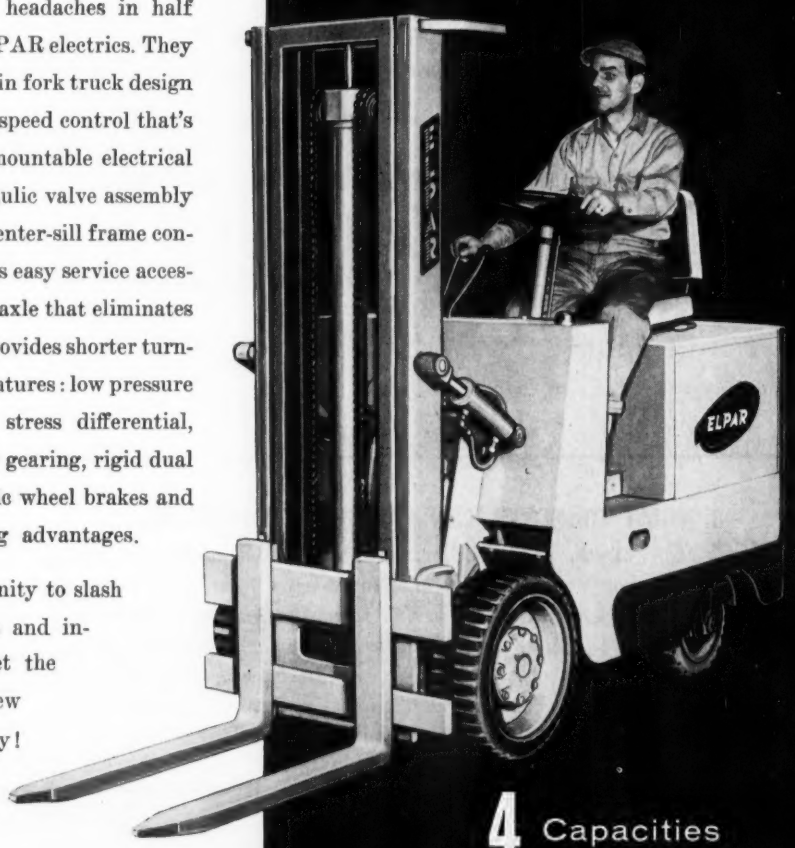
Cut your maintenance headaches in half with this new line of ELPAR electrics. They represent a new concept in fork truck design with . . . a new step-less speed control that's simple to maintain; demountable electrical control panel and hydraulic valve assembly for fast bench repairs; center-sill frame construction that guarantees easy service accessability; caster steering axle that eliminates steering knuckles and provides shorter turning radius. Plus these features: low pressure hydraulic system, low stress differential, completely housed drive gearing, rigid dual tilt mountings, hydraulic wheel brakes and many more cost cutting advantages.

Don't miss this opportunity to slash your maintenance costs and increase productivity. Get the facts on ELPAR's new "Acro Smooth" line today!

Send for This New Folder—get complete details on this new line of ELPAR electric fork trucks.

THE ELWELL-PARKER ELECTRIC COMPANY
4312 ST. CLAIR AVE. • CLEVELAND 3, OHIO

Slash Truck Maintenance 55%



4 Capacities
Individual models for 4,000, 5,000, 6,000 and 7,000 lbs.

ELPAR
ELECTRIC TRUCKS

Circle 595 on Page 53

big stuff to quality-inspect?

need to radiograph giant castings
for reactor systems?
or weldments on thick-walled
pressure vessels?
or feet-thick solid fuel volumes?
or even heavy lead slabs, maybe?

such jumbo jobs are meat for the massive power (2-3 million volt equivalent) of Picker's Cobalt 60 **Cyclops.** *for instance . . .*

it will find a flaw this small● in a 10″ thick steel casting . . . the penetrameter will show clearly on the film

(Cyclops users readily produce radiographs that meet and often better the 2% sensitivity requirements of most radiographic inspection codes.)

with radiographic power like that, Cyclops makes short shrift of less formidable jobs, too . . .

gets through 5″ of steel in 5 minutes

(And thanks to its unique collimator, secondary radiation is so cut down that radiographs made with Cyclops are characteristically snappy with detail-disclosing contrast.)

Cyclops is compact enough to mount on a go-to-the-job mobile carriage

(Or on a variety of other supports tailored to the workload. Seen here is a jib-mounted unit at Cooper-Alloy Corporation

big surprise is Cyclops low cost

(about one-fourth the price of equivalent energy x-ray equipment)

Picker x-ray

There's much more to tell about Cyclops. Get the full story from your local Picker office (see 'phone book) or write Picker X-Ray Corporation, 25 So. Broadway, White Plains, New York.

Circle 596 on Page 53

A Timely Message for Foundry Managements

FLEXIBILITY INSURES PROFITS

With a modern manufacturing approach, utilizing segmented composite patterns, your foundry can achieve the flexibility vital to today's production-jobbing foundry requirements. Knight Engineers have the experience to apply modern techniques so that one mold or thousands may be produced competitively. Knight has engineered foundries with the highest productivity per man hour here and abroad. An audit of your facilities, methods requirements and opportunities for improvement may be had by calling or writing for a Knight Engineer.

KNIGHT SERVICES INCLUDE:

Foundry Engineering • Architectural Engineering • Construction Management • Organization Management • Industrial Engineering • Wage Incentives • Cost Control • Standard Costs Flexible Budgeting • Production Control • Modernization • Mechanization • Methods Materials Handling • Automation • Survey of Facilities • Marketing

Lester B. Knight & Associates, Inc.

Management, Industrial and Plant Engineers

Member of the Association of Consulting Management Engineers, Inc.

549 W. Randolph St., Chicago 6, Ill.

New York Office—Lester B. Knight & Associates, Inc., Management Consultants, 500 Fifth Ave., New York 36
Knight Engineering Establishment (Vaduz), Zurich Branch, Dreikönigstrasse 21, Zurich, Switzerland
Lester B. Knight & Associates, G.M.B.H., Berliner Allee 47, Düsseldorf, Germany

Circle 597 on Page 53

Circle 598 on Page 53→

Pay less for more strength! Tenzaloy the self-aging aluminum alloy needs no heat treatment! If your aluminum castings are too large or too intricate for heat treatment, if your heat treating facilities are limited, if you need superior strength than you get from ordinary heat-treated alloy demand "Federated Tenzaloy" developed by Federated to meet the need for a superior aluminum alloy that ages at room temperature. Tenzaloy eliminates rejects due to warpage, expansion, and internal stresses caused by quenching. Tenzaloy finished properties are stable, proved by conclusive test data over a ten year period. No special foundry techniques are required. No fluxes. Castability is excellent with sand cast and plaster molds and many permanent molds. Tenzaloy will not "grow," produces corrosion-resistant castings with excellent polishing characteristics and anodizes clear white. Write for Tenzaloy Bulletin No. 103. Federated Metals Division, 120 Broadway, New York 5. In Canada: Federated Metals Canada, Ltd., Toronto and Montreal.

FEDERATED METALS DIVISION OF

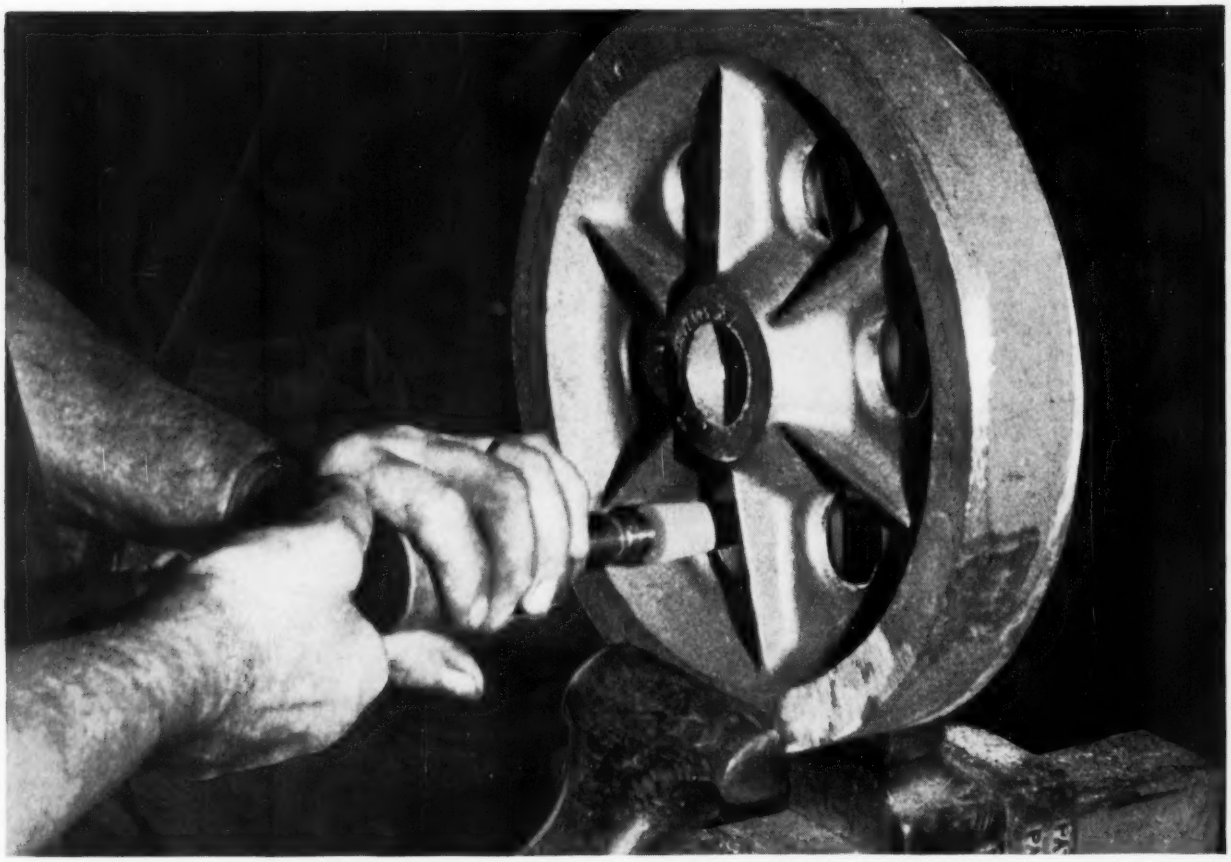
ASARCO

AMERICAN SMELTING AND REFINING COMPANY

TENZALOY is one of a complete series of Federated aluminum casting alloys. A new plant in Alton, Ill. will soon be in production to satisfy the requirements for Tenzaloy in the mid-west.

55-38

32 ALUNDUM Abrasive for your gray iron castings*



Here's how Norton keeps "Making better products . . .

In snagging, as throughout their entire job range, Norton mounted wheels are hitting new highs in grinding efficiency. Outstanding new developments in abrasives and wheel construction eliminate loading and glazing — besides giving you the fastest cutting rate, with a marked increase of stock removed per wheel.

These advantages are the natural results of Norton Company's long experience in engineering mounted wheels for best performance on every application – such as tool and die finishing, metal pattern work and all kinds of rough grinding.

For steel castings, wheels of tough 44 ALUNDUM abrasive with VBE bond are the most efficient abrasive-bond combination you can get. And they're best for weld grinding, too.

For gray iron, wheels of sharp 32 ALUNDUM abrasive with VBE bond, outperform silicon carbide wheels consistently.

Norton mounted wheels have already proved their cost-cutting, product-improving ability. "There has never been anything like them for speed and economy in our snagging," says the foreman of a leading foundry.

44 ALUNDUM* Abrasive for your steel castings

to make your products better"

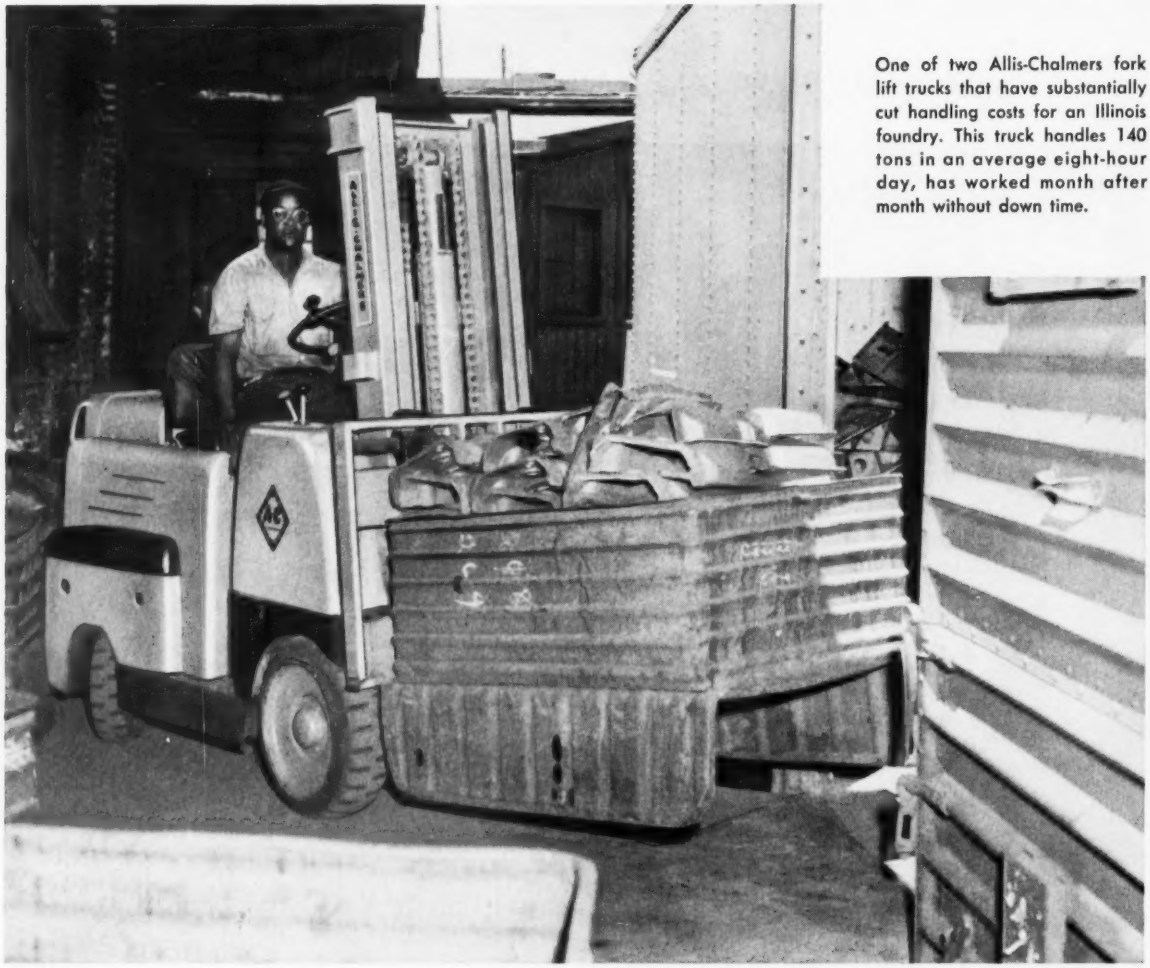
Every Norton mounted wheel is accurately trued *after mounting* on rust-proof stainless steel mandrels. Developed to increase the time-and-money-saving "Touch of Gold," Norton mounted wheels are stocked in approximately 200 standard shapes and sizes. See your Norton Distributor for prompt deliveries. Or write to NORTON COMPANY, General Offices, Worcester 6, Massachusetts. Plants and distributors around the world.

NORTON
ABRASIVES

*Trade-Mark Reg. U.S. Pat. Off. and Foreign Countries W-1954

75 years of . . . Making better products . . . to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Machine Tools • Refractories • Electro-Chemicals — **BEHR-MANNING DIVISION:** Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes



One of two Allis-Chalmers fork lift trucks that have substantially cut handling costs for an Illinois foundry. This truck handles 140 tons in an average eight-hour day, has worked month after month without down time.

There's a

dollar-saving difference

in Allis-Chalmers Lift Trucks

. . . and the difference grows by the hour.

Sometimes it takes 10,000 hours or more to prove: No other lift truck can be expected to operate as steadily, as economically for as long a time as an Allis-Chalmers.

This is a conclusion reached by users in many different industries. They are users who have kept detailed records of operation and maintenance costs . . . that *prove* there is a dollar-saving difference. Many of their case histories are available for the asking.

Let your Allis-Chalmers dealer show you some of the many years-ahead design features that make the dollar-saving difference. Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

BH-128A

WEIRTON STEEL COMPANY

12 B&W IFB lined single stack annealing covers in use in the strip annealing department of Weirton Steel Company, a division of National Steel Corporation, at Weirton, West Virginia.

uses lightweight B&W Insulating Firebrick for single stack annealing covers.

These 12 covers, lined with B&W K-20 Insulating Firebrick, have been in service more than two years in the annealing of low and high carbon strip from Weirton's 54″ strip mill. Identical in construction, the covers are over 17 feet from base to skew and over 10 feet in diameter. The domes are of 9″ K-20 IFB construction.

The K-20 is one of B&W's *lightweight* Insulating Firebrick. In fact, B&W K-20 IFB are at least a third of a pound lighter than other 2000 F insulating firebrick. This means savings in the overall weight of portable covers. Additional savings in fuel consumption and cycle time are possible because lightweight B&W IFB store and conduct less heat. Heat is kept in the furnace, not in the lining.

This application points out advantages of light weight in insulating firebrick constructions. And B&W makes the *lightest* weight insulating firebrick. Consult your B&W Refractories Representative for information on how you can profit with lightweight B&W IFB.

Bulletin R-2-H available on request.

Circle 602 on Page 53

B&W

THE BABCOCK & WILCOX COMPANY

REFRACTORIES DIVISION

B&W Firebrick, Insulating Firebrick, and Refractory Castables, Plastics, Ramming Mixes, Mortars, and Ceramic Fiber.

BOOST PRODUCTION UP TO 25%

MANHATTAN REINFORCED CUT-OFF WHEELS

"MORE USE PER DOLLAR"

- **MORE CUTS AT LOWER COST**
- **FASTER PRODUCTION**
- **GREATER SAFETY**
- **CUSTOM-MADE FOR YOUR JOB**

Job records prove these wheels take the abuse of heavy cutting in foundry operations—far beyond the limits of ordinary cut-off wheels! Here's why:

MANHATTAN REINFORCED CUT-OFF WHEELS ARE REINFORCED TWO WAYS

1. Special fibers in Manhattan's Bond increase by 50% the wheel's strength to withstand destruction by centrifugal force.
2. Super-strength synthetic lateral reinforcement gives a degree of resistance to side-strain not possible with ordinary wheels.

DOUBLE REINFORCEMENT ADDS UP TO DOUBLE SAFETY—AND PROTECTION FROM BREAKAGE, TOO!

Let a Manhattan sales engineer show you how to get "More Use per Dollar" with Manhattan Reinforced Cut-Off Wheels and other types of Manhattan high speed, heavy duty wheels.

ENGINEERED RUBBER PRODUCTS ... MORE USE PER DOLLAR

RM

RM-1064

WRITE TO ABRASIVE WHEEL DEPARTMENT

MANHATTAN RUBBER DIVISION • PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Circle 603 on Page 53

ROYER OFFERS A PRACTICAL SOLUTION TO HOT SAND PROBLEMS

In today's foundry operation, time is probably the most costly element the superintendent must deal with. Sand used for today's casting must be conditioned and ready for use tomorrow. This frequently means sand conditioning at temperatures ranging up to 300° to 400°F.

These destructive high temperature operating conditions seem to plague every foundryman. Foundry equipment suppliers have offered many possible solutions—cooling towers, shake-out belt cooling, water cooling, rotary cooling, bin cooling, etc. But probably no manufacturer has offered more thorough cooling per dollar of invested capital than that obtained with Royer equipment.

All Royer Foundry Units employ the famous Royer Belt Combing Principle. In operation, a combing and mixing action takes place in the feed hopper. This breakdown of the hot sand mass releases the hot gases as the first step

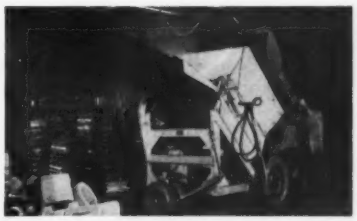
in Royer Cooling. Further cooling of the individual sand particles takes place as the conditioned sand is discharged in an open stream. And finally, the sand heap, now open, light and fluffy, continues cooling at a very rapid rate.

There is a Royer Foundry Unit to solve every sand conditioning problem. Your inquiry is invited. We promise prompt reply—without obligation.

Sand, from a central conditioning station . . .
moves by tractor in a front-end loader to . . .
Model NYP-E Royer for cooling, aerating and fluffing at the molding station for maximum benefits.

THERE IS A SAND CONDITIONING SYSTEM TO FIT YOUR BUDGET . . .

Here is a positive cost-cutting sand conditioning system that falls within the budget limitations of the small or medium semi-mechanized foundry. It delivers better sand without adding to time or manpower requirements, and without the expense of complete mechanization. It gains the advantages of fluffing after handling, as the final step at the molding station.



Teamed with front-end loader, this Royer NYP-E Portable moves from floor to floor in this grey iron foundry. What used to be caked, packed sand from mulling is now a cool, fluffy pile.

An integral part of this practical system is the Royer Model NYP-E Sand Separator and Blender. It can be moved swiftly from station to station, delivering cooled, aerated, fluffed, perfectly conditioned sand right where it's wanted. With this Royer you can really get all the advantages of central system sand control.

Your system is probably "different." There's still a versatile unit of the Royer "NY" Series to fit it . . . and improve it. As a stationary model, the "NY" will fit into a conveyor system, or can be installed to take the discharge of stiff sand directly from your muller. However you use it, the Royer vastly improves sand, saves time and money, improves yield and quality of castings —all at a fraction of a cent per ton of sand.

We'll be happy to have an experienced, foundry-wise Royer agent call to help you work out the system that's best for your operation. Or, if you prefer, we'll rush you a copy of Bulletin NY-54, giving further information about these units and how you will benefit from them. When you're convinced, *you* can call in your Royer agent and take the first step towards better sand with a Royer system.

ROYER FOUNDRY & MACHINE CO.

ROYER 159 PRINGLE STREET KINGSTON, PENNA.

☐ Tell your agent to call.
☐ Rush me a copy of Bulletin NY-54.

NAME_____
COMPANY_____
ADDRESS_____
CITY_____ ZONE_____ STATE_____

Circle 604 on Page 53

How to dress Safely for 3000°F molten splash exposure!

AO THERMOGARB ASBESTOS

It won't burn or char when spattered with 3000°F molten metal splash (other fabrics will)! A 30 inch coat weighs only 3¾ lbs. as against 6½ lbs. for conventional asbestos! These are major advantages of AO Thermogarb asbestos clothing.

This remarkable material offers almost double the tensile strength* of fabrics twice its weight and thickness . . . and 40% — 50% greater abrasion resistance than untreated asbestos. Your protective clothing dollars go farther. In addition to high heat and metal splash, Thermogarb is recommended for exposures to glass, chemicals, ceramics and oils.

AO Thermogarb will save you money. It is available in a complete line of AO protective clothing including coats, leggings, cape sleeves, coveralls, sleevelets, spats, pants, chaps and aprons — in white or yellow. ("W" before cat. no. means white. "Y" means yellow.) Your nearest AO Safety Products Representative can supply you.

*Even before treatment, more after treatment.

Spring type legging with replaceable covers which attach to frame by snap fasteners. Frame or covering can be ordered separately. Cat. No. W1481.

Arm, chest and shoulder protection in a cape sleeve and bib. All seams double stitched. Bib attached to front of cape with snap fasteners. Anchor button at each armpit. Cat. No. W208B.

Coat completely protects from neck to below knees.

Wool collar. Snap fastener adjustment on cuffs for snug fit. Snap fasteners on front have leather pull tabs for quick removal. All seams double-stitched. 6 standard coat lengths — coat shown is 44". Cat No. W204-44.

BE SAFE FOR SURE — WITH AO SUREGUARD PROTECTIVE EQUIPMENT

Always insist on AO Trademarked Safety Products.

American Optical COMPANY
SAFETY PRODUCTS DIVISION
SOUTHBRIDGE, MASSACHUSETTS
Safety Service Centers in Principal Cities

AO 9-102

Circle 605 on Page 53

STANDARD QUALITY

means sand the same every time

Blackhawk silica has the same purity, uniformity, and dependability with every order and in any quantity. That's what Standard specification means to you, Mr. Foundryman, whose product quality depends on the ingredients you use.

Standard's silica is mined from an area wonderfully rich in tremendous deposits of St. Peter's sandstone. Painstaking washing and grading processes produce foundry sands second to none in the world.

The Blackhawk brand possesses an unusually high sintering and fusion temperature point plus marked permeability which allows free passage of gases.

Standard's accessibility to both excellent rail and water transport facilities affords swift delivery anywhere in the nation. For your next order of silica sand, phone the Standard distributor in your area.

BLACKHAWK SILICA SAND

The Blackhawk brand—used throughout the foundry industry as steel molding sands, special core sands, opening and parting sands, and facing sands.

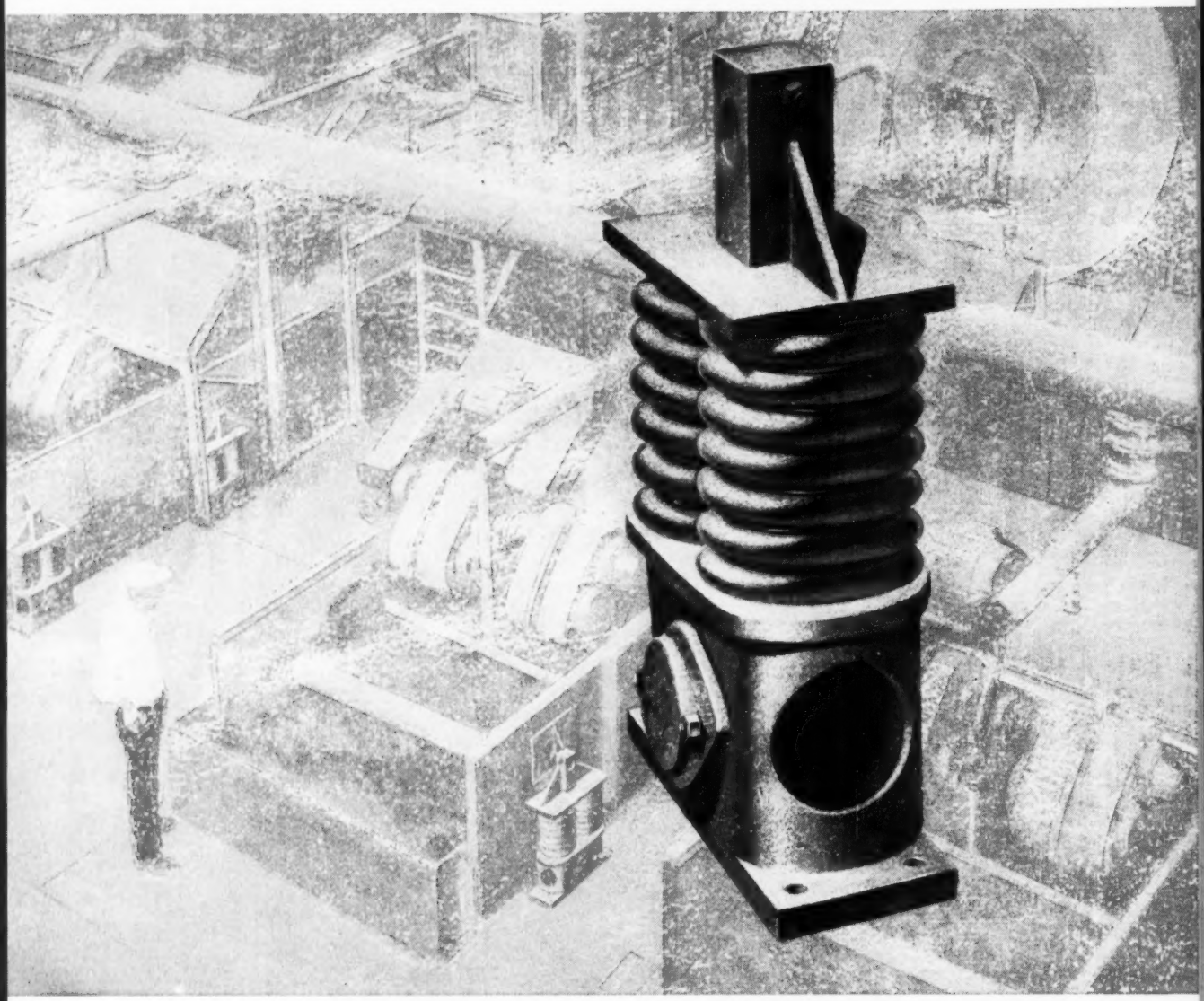
STANDARD SILICA COMPANY

STANDARD
Silica Company
OTTAWA • ILLINOIS

Silica Center of the World

Circle 606 on Page 53

How the Foundry Industry Serves America . . . #4 of a Series



CAST IRON SPRING BASES IMPROVE PERFORMANCE, CUT MACHINING TIME 30%

When the spring bases of this big vibrating screen were redesigned from plate weldments to gray iron castings, it effected not only a substantial cost saving, but also provided maximum stability to the structure.

The excellent compressive strength and damping characteristics which are inherent in gray cast iron combine to make it an ideal material for this particular application, namely, a sturdy dependable supporting part for a structural or machine unit.

Modern foundries look to the Hanna Furnace Corporation for their supplies of all regular grades of pig iron . . . foundry, malleable, Bessemer, intermediate low phosphorus as well as HANNATITE® and Hanna Silvery.

Facts from files of Gray Iron Founders' Society

HANNA
THE BEST KNOWN NAME IN IRON

THE HANNA FURNACE CORPORATION
Buffalo • Detroit • New York • Philadelphia
Merchant Pig Iron Division of
NATIONAL STEEL CORPORATION

Circle 607 on Page 53

Readers' Comment

Solidification, Heat Treatment

To THE EDITORS:

Thank you very much for the reprints on "Solidification and Heat Treatment." We read the articles when they appeared with very considerable interest and discussed them at length. We shall make good use of them and may order additional through the proper channels.

AUSTEN J. SMITH
Head
Department of Metallurgical Engineering
Michigan State University, East Lansing, Mich.

To THE EDITORS:

Thank you for the ten extra copies of your series of articles on "Solidification and Heat Treatment."

This is certainly a very worthwhile series of articles and they have been done up nicely for use by educators. They will be very helpful in every way.

HOWARD F. TAYLOR
Professor
Massachusetts Institute of Technology
Cambridge 39, Mass.

Editor's note: Single copies of reprints of this series of articles are available as long as the supply lasts.

To THE EDITORS:

FOUNDRY scores again. Your foresight in making "Solidification and Heat Treatment" available as a reprint was an excellent gesture.

You might be interested in knowing that our current FEF students are using the material in class. It is required reading in preparation for discussion.

W. P. WINTER
Assistant Professor
College of Engineering and Architecture
Pennsylvania State University
University Park, Pa.

We Didn't Do Right by 1951

To THE EDITORS:

What have you good folks done to our best foundry year, 1951? I'm referring to the chart at the top of Page 65 of the January issue of FOUNDRY.

It shows 1951 shipments of less than 15 million tons instead of 19 plus million tons in that record year! You do have the correct figures in the article which accompanied the chart.

DONALD H. WORKMAN
Executive Vice President
Gray Iron Founders' Society Inc.
National City-E. 6th Bldg.
Cleveland 14, Ohio

Editor's note: How right you are! We cut the 1951 total by about 4½ million tons. A corrected version of the chart in question appears below, with the artist and the editor who checked his work hauling the line up to its proper position. Single copies of reprints of the article—with the corrected chart—are available as long as the supply lasts.

In the interest of the American foundry industry, this ad (see opposite page) will also appear in

STEEL
IRON AGE
MODERN CASTINGS
AMERICAN METAL MARKET

FREE!

REPRINTS OF THIS AD WITH YOUR FIRM'S SIGNATURE

If you would like to have reprints of this ad to mail to your customers and prospects, let us know. Reprints will have no Hanna product message or signature, but will be imprinted with your firm name and address. Absolutely no obligation. To order your reprints, fill in and mail the coupon below.

The Hanna Furnace Corporation
Detroit 29, Michigan

Please send me_____reprints of Ad No.
(No.)
____of your Foundry Industry Series.
Imprint as follows:

_____

_____

_____

Send reprints to:

NAME_____

I understand there is no charge for this service.

Circle 607 on Page 53

"Even our standard stock wheel

Elden L. Auker, Vice President—Marketing of Bay State Abrasives, is a man who knows the industry through years of experience both in working in the field with Bay State customers and from close association with the research and development programs at Bay State's manufacturing headquarters in Westboro, Mass.

"There is one positive way to make sure that you use correct grinding wheels . . . That is to *test* them. Test by the clock for speed and durability . . . and by the adding machine for cost per hour of useful life. That's the way they do it at Omaha Steel Works, one of the largest and most diversified processors of structural steel, weldments and steel castings in the entire western area of the United States.

"Omaha's General Cleaning Room Foreman Otis Bundy and Purchasing Agent C. C. Gash recently ran the kind of tests I'm talking about to find the best possible wheel for finish-grinding steel castings like the Caterpillar track-carrier castings shown here.

"Along with representatives of other major abrasive manufacturers, Bay State Abrasive Specialist Gene Miller was asked to provide wheels for testing. As Gene himself says: 'This one was a dilly. No special problem to solve and sales talk was strictly *verboten*. This was one time the wheels were on their own.'

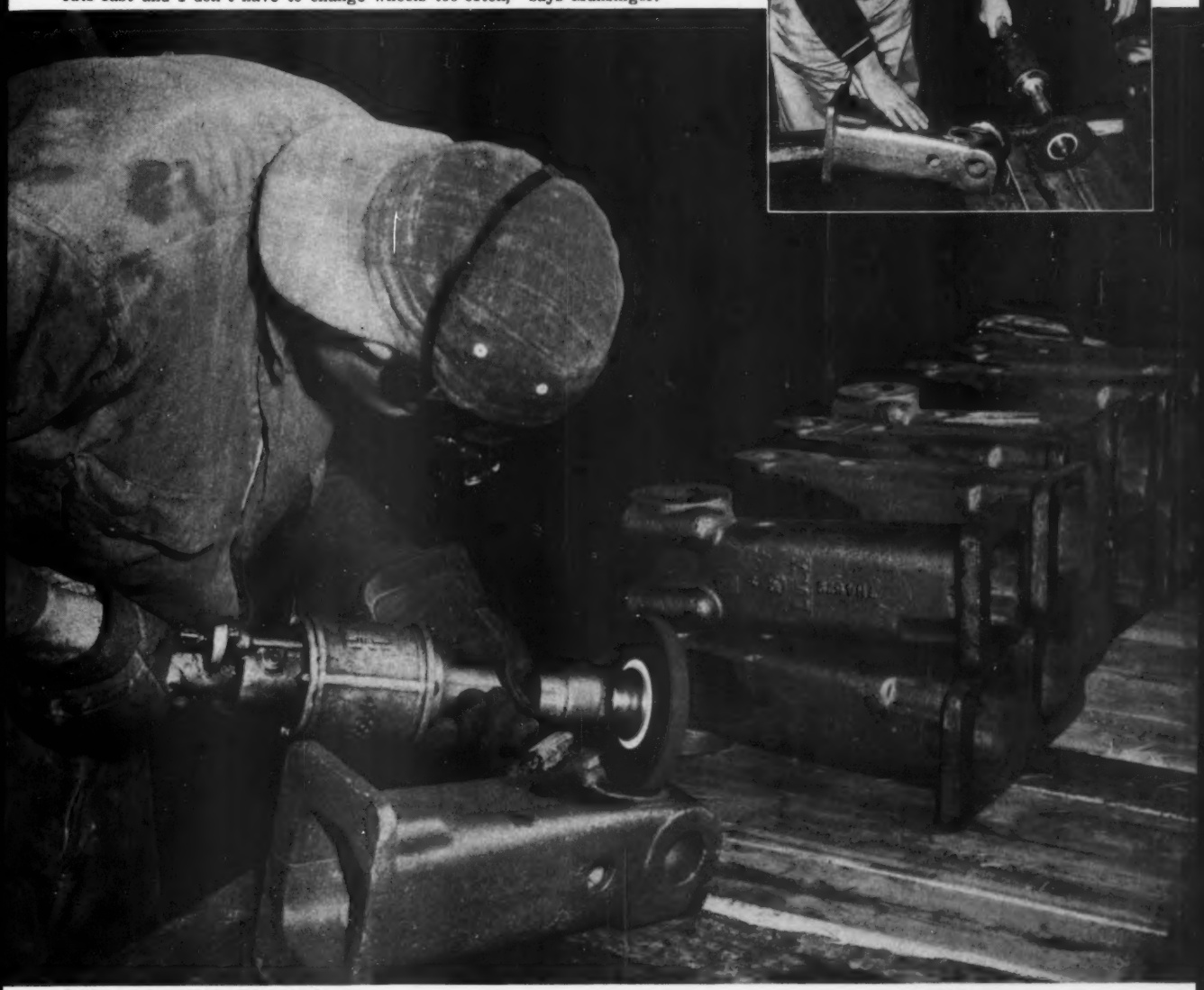
"With Omaha's Chief Inspector Lloyd Base acting as referee, every aspect of each wheel's performance was examined, checked and double-checked. The result was satisfying all around. Bay State's standard, stock specification beat out all comers in cutting speed and length of life . . . and consequently cost less per hour as well as cutting down-time due to wheel changes. As Otis Bundy said: 'It stands up and it cuts fast and that's what we're looking for.'

"Well, your own Bay State representative is always ready to compete on a cost basis when it comes to tests . . . and he's also thoroughly trained to work intelligently on the special technical problems that come up from time to time in any grinding operation. *Better grinding at lower cost . . . that is our business.*"

beat out all competition at OMAHA STEEL WORKS"

(Right) Chief Inspector Lloyd Base and Bay State Abrasive Specialist Gene Miller examine results achieved with Bay State finish-grinding wheel.

(Below) Operator Vincent Munsinger finish-grinds steel track-carrier casting with Bay State's 6 x ¾ x ⅝ wheel on a portable air grinder. "This wheel cuts fast and I don't have to change wheels too often," says Munsinger.



(Safety guard removed for photography)

BAY STATE ABRASIVES

BAY STATE WHEELS of PROGRESS

Bay State Abrasive Products Co., Westboro, Massachusetts.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Chicago, Cleveland, Detroit, Los Angeles, Pittsburgh. *Distributors:* All principal cities.

Circle 608 on Page 53

Sterling's all-time heavyweight champion

Extra Heavy Duty

FOUNDRY FLASK

...always the huskiest performer on any foundry floor

BUILT TO ENDURE

PERFORMANCE-PROVED BENEFITS OF THIS ADVANCED STERLING DESIGN

- Individually Engineered
- Oversize Flanges — Extra Thick, Extra Wide
- Heavier Walls — Heavier Solid Reinforcing
- Flanges and Lateral Reinforcing Members Automatically Welded to Flask Walls
- Stress Relieved if Desired
- Jig-Welded Fittings
- Precision-Machined Surfaces
- Accurately Installed Pins and Bushings

For sheer brute strength and endurance... none today can match Sterling's extra heavy duty flask construction. Product of an extensive laboratory and field research program, this outstanding development coordinates in one unit many of the important breakthroughs in metallurgy, welding and design.

In every detail, advanced techniques, extra safety factors and high-performance engineering concepts are included in this design to assure unmatched endurance and long service. In accuracy, too, low-tolerance machining of flanges combined with accurately-matched pins and bushings help to produce castings capable of meeting today's rigid specifications. Here's proof again that, when profits are at stake, it always pays to depend on Sterling.

AO-4538

Circle 609 on Page 53

STERLING NATIONAL INDUSTRIES, INC.
Founded in 1904 as Sterling Wheelbarrow Co.
Milwaukee 14, Wisconsin, U.S.A.
Associate: STERLING FOUNDRY SPECIALTIES LTD.
LONDON • BEDFORD • JARROW-on-TYNE, ENGLAND

Sterling

WORLD WIDE SERVICE

WHEREVER METALS ARE CAST FOUNDRY
FEBRUARY 1960

More Inflation

During the prolonged steel strike many people advocated the use of compulsory arbitration to settle management-labor disputes. It all seemed so simple. Under government supervision, arbitrators would study the problem and render a decision fair to all parties.

The fantastic attitude of government in the steel strike settlement should have disillusioned even the strongest advocate of compulsory arbitration. A politically minded administration forced a settlement completely favoring the union and disregarding management's desire for changes that would help slow down the inflation that continues to eat away the value of the consumer's dollar.

With this type of coercion of business on the part of government, the comment of the secretary of labor to the effect that if steel management and labor work together to boost production there will be no price increase for some time to come, seems a bit childish. Management wanted to stop inflation and keep its product more competitive, labor fought the elimination of wasteful practices, and government forced a labor victory. Before long this must result in higher prices and a possible loss of more steel markets to foreign producers, or to manufacturers of other types of metals or materials.

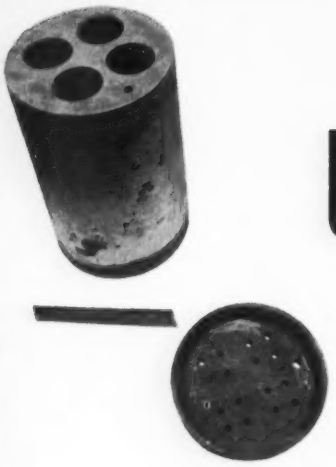
What does this settlement mean to the foundry industry where better than 85 per cent of the companies are classified as small business? It could mean higher prices for raw materials used by ferrous foundries.

The effect on the wage structure of foundries remains to be seen. Reports indicate that during recent months foundries having various unions, including the Steelworkers, settled for an increase considerably lower than that of basic steel.

Should any union try to force a higher settlement for those companies whose contracts now are expiring, higher prices for castings will be mandatory if those foundries are to stay in black ink. The reason is simple. The percentage of cost allocated to labor is twice as much in the production of a ton of castings as it is in the manufacture of a ton of rolled steel. Foundries find that almost 50 per cent of their cost is accounted for by labor. With such higher labor costs an unrealistic settlement cannot be absorbed with present prices. The problem is complicated by the question of whether the foundry can increase prices and still meet competition.

All this talk in Washington about helping small business appears to be just lip service.

Frank G. Steinebach
Editor



URANIUM FOUNDRY

In addition to its fission-sustaining characteristics, uranium is a uniquely high-strength, high-density material. Uranium castings may be used in nuclear-powered space ships

Fig. 1—Graphite mold for manufacturing four cylinder castings. Disc at the right is to direct molten uranium into the cavities

● UNTIL RECENTLY, the use of uranium metal has been confined to nuclear applications. Due to its nuclear properties—primarily its ability to sustain a fission chain reaction—uranium has been used as a fuel for nuclear reactors and for components of atomic weapons.

Natural uranium, however, has only a small percentage (approximately 0.7 per cent) of uranium-235. This isotope is required for successfully sustaining a chain reaction. The bulk of natural uranium therefore must be discounted as a nuclear fuel.

Another interesting nuclear characteristic of uranium is its ability to absorb large amounts of intense gamma radiation. Uranium 1 in. thick will absorb the same amount of radiation which will be absorbed by 12 to 15 in. of steel, the exact relationship being determined by the intensity of the gamma radiation. This characteristic, while not as profound as the fission-sustaining characteristic, may very likely be responsible for the use of uranium alloys in nuclear-powered space ships.

For structural applications, uranium alloys have a third property which distinguishes them from all other structural materials—they are probably the heaviest known structural materials. They have densities of approximately .67 lb per cu in. which make them 50 per cent heavier than lead. While this is not normally desirable for structural members, there are applications in design which require a high-strength, high-density material. Uranium uniquely satisfies this requirement. It can be alloyed and heat treated to mechanical properties up to 140,000 psi yield strength (0.1 per cent offset), while retaining an elongation of 15 per cent and a reduction in area of 45 per cent. By proper heat treatment, a Charpy V notch impact energy of 10 ft-lb at minus 40° F can be obtained.

Because of the general characteristics outlined above, the Watertown Arsenal has been engaged in the development and pilot production of classified Ordnance uranium parts since 1956. From this development has grown a foundry practice suitable for casting uranium parts of exceptional soundness and uniformly high mechanical properties.

Foundry Practice—The overriding consideration in casting uranium is its extreme chemical reactivity. Molten uranium will react with silica, graphite, silicon carbide, and all gases normally present in foundry atmospheres. Thus, if uranium is conventionally air-melted and poured, violent chemical reactions will occur which prevent one from obtaining a satisfactory casting. In fact, a porous conglomeration of metal, carbides, and oxides will result if conventional melting is attempted. Vacuum melting and pouring are required, and the castings produced must be kept under high vacuum until they have cooled to approximately 1200° F.

Molding — Graphite permanent molds normally are used for uranium castings because they can be coated with a suitable refractory wash to prevent contamination of the casting by carbon. Also, they can be induction heated to establish temperature gradients in the mold, thus insuring a completely sound casting.

Steel and copper molds can be used but are harder to machine than graphite, and have short lives. Ceramic molds which are as chemically inert as mullite can be used. When ceramic molds are used, they must be risered similar to the risering one would use for steel castings. Gating is not as important in vacuum melting due to the absence of mold gases which form oxides and slag in normal foundry operations.

In designing a typical graphite mold, an example of which is shown in Fig. 1, a riser volume of 20 per cent is used and a shrinkage allowance of 1.8-2.2 per cent is made, depending on the degree of restraint produced by the graphite mold. The mold shown is for manufacturing four cylinder castings; the disc to the right of the mold is used to direct the molten uranium into the top of the mold cavities.

The graphite molds and crucibles are coated with a duplex refractory wash consisting of a thin zirconite base over which a coating of fine mullite is placed. Both washes are applied by brushes. After the molds are coated, they are baked in an oven at 400° F for a minimum of two hours. Carbon pickup from molds coated in this manner is essentially zero.

Vacuum System—A line drawing of the Watertown Arsenal vacuum

PRACTICE

By G. D. CHANDLEY and D. G. FLACK
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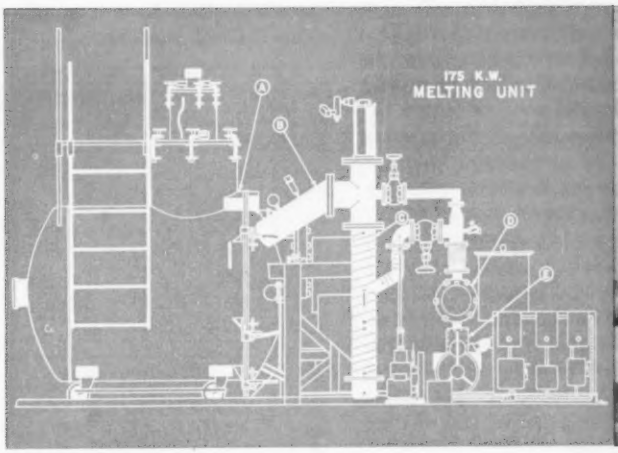

Fig. 2—Functional line drawing of the Watertown Arsenal vacuum tank and pumping system

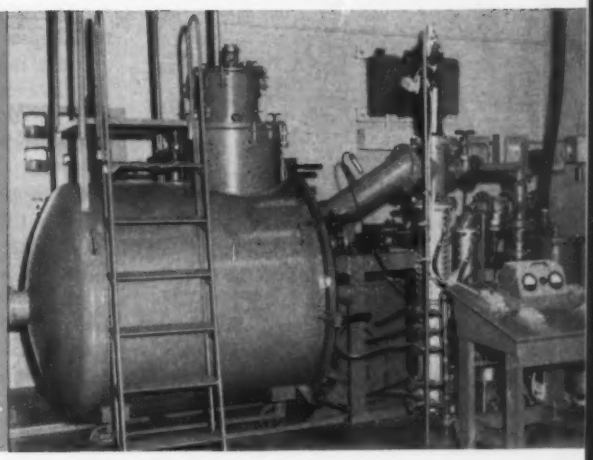

Fig. 3—Photo of the vacuum system. The main vacuum tank houses the melting furnace

system is shown in Fig. 2. *A* is the main vacuum tank, 4 ft ID, which houses the induction melting furnace. It is a double-walled steel tank with freely circulating cooling water between the two walls. *B* is the pumping system outlet mounted in the stationary part of the tank which leads into the 6000 cfm booster diffusion pump *C*, through the liquid nitrogen cold trap *D*, to the 110-cfm mechanical pump *E*.

During the initial pumping, gases bypass the diffusion pump, and the mechanical pump is used to reduce the chamber pressure to approximately 300 microns (390 millionths of an atmosphere). At this point the booster diffusion pump is connected between the mechanical pump and the chamber, lowering the chamber pressure to approximately one micron. One micron is 1.3 millionths of an atmosphere, which means that of each million molecules of gas initially present in the chamber, about 999,998 molecules are removed. This is the vacuum under which uranium melting is begun. Pressure increases up to 200 microns during melting have not caused any injurious contamination. A picture of the vacuum system is shown in Fig. 3.

Melting and Casting — A line drawing of the induction melting and casting unit which is housed within the vacuum chamber is shown in Fig. 4. For purposes of clarity the furnace frame and power leads are not included in the drawing.

After the proper vacuum has been established in the chamber, the melting current is turned on and the graphite crucible is induction heated, melting the uranium charge mainly by radiation. A coating similar to that described for the graphite molds is used to prevent the molten uranium from reacting with the graphite crucible. When the uranium charge is melted and superheated for proper alloying, tapping is performed once temperature conditions within the mold and crucible are satisfactory.

As mentioned previously, the induction field is used to establish temperature gradients in the mold cavity in order to insure an absolutely sound casting. A sound cast-

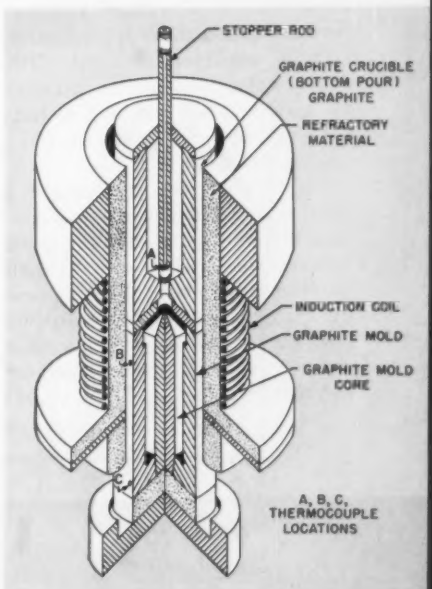

Fig. 4—Drawing of the induction housing and casting unit which is housed within the vacuum chamber. Drawing does not include furnace frame and power leads

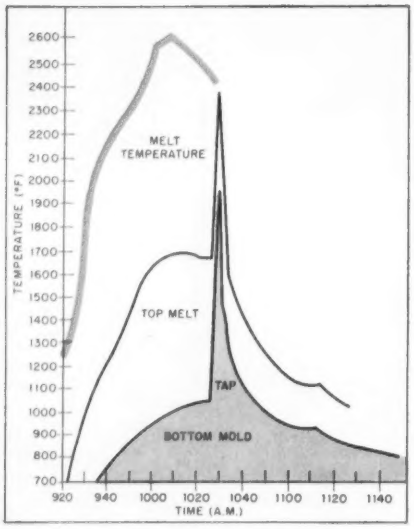

Fig. 5—Thermal history of a uranium casting ¾ in. x 14 in.

ing will be obtained if the top of the mold is approximately 100° F below the melting point of the alloy being cast and the bottom of the mold is approximately 1300° F. A minimum of 1300° F is selected to insure complete evolution of adsorbed gases from the mold.

Since uranium alloys melt in the range of 2050° F to 2300° F, a temperature gradient of approximately 1000° F usually is obtained. This temperature gradient is adequate for thin castings and sound, thick castings may be produced by a smaller gradient.

For tapping, the stopper rod is lifted and the molten uranium flows from the crucible through the spacer between the crucible and the mold into the mold cavity. In some cases the induction current is maintained after the casting has been poured in order to enhance further the temperature gradient. Even though the molds are preheated to very high temperatures, solidification takes place rapidly.

A thermal history of a ¾-in. uranium casting about 14 in. long is shown in Fig. 5. The casting solidifies so rapidly that normal temperature recorders do not respond fast enough to measure the gradient exactly. Castings poured in the above fashion with approximately 100° F superheat will have a fine-grain structure and excellent surface finish which will show the brush marks left when the mold wash is applied.

Health Precautions—The care one must exercise in handling uranium base alloys depends to a great extent on the concentration of U-235. Certain types of uranium have a very low level of radioactivity, and radiation is not a major consideration. To guard against possible exposures, however, it is desirable that all personnel have regular physical examinations and wear film badges if they are assigned in the melting area full time.

For normal and depleted uranium the major hazard is not in radioactivity but in breathing uranium oxide dust or fumes which form during processing. Uranium will cause a lung irritation similar to silicosis, but normally it will not cause any ill effects if ingested. It is required that air samples be taken regularly during operations such as removing the casting from the mold and cleaning crucibles for re-use. If a dangerous level of dust is indicated, these operations should be confined to exhausted hoods.

Casting Quality—Casting quality may be checked by conventional nonmagnetic inspection methods. Fig. 6 is a typical radiograph of a bushing type casting made in the mold in Fig. 4. Due to the great absorption of gamma rays by the uranium, very high voltages and long exposure times are required. In Fig. 6 the top of the casting is shown to be sound in the vicinity of the X. Above the X, the upper dark part of the radiograph is the riser, and the white cloudiness shows the concentration of solidification shrinkage well above the top of the casting. This radiograph of approximately a ¾-in. wall thickness was made by a 2 million volt Van deGraff machine.

Most uranium alloy castings can be macro-etched to determine the grain structure. For example, a macro-etch of a coarse-grained uranium casting is shown in Fig. 7. These crystals are quite large and result in inferior mechanical properties. By proper control of the alloying, melting, and pouring temperatures, very fine-grained uranium castings can be made. Fig. 8 is a typical example of a fine-grained casting. The crystals in this macro-etch are too fine to be distinguished with the naked eye. This type of structure has uniformly high mechanical properties with excellent ductility.

Chemical analysis is of the utmost importance in maintaining the quality of high-strength uranium castings. The elements normally analyzed for, in addition to those used for alloying, are carbon, oxygen, hydrogen, nitrogen, and silicon. These elements are reported in parts per million since very small amounts of them can cause a marked lowering of mechanical properties. For example, if the hydrogen content is increased from 0.8 part per million to 2.5 parts per million, the ductility of the uranium will be reduced to a fraction of its original value; reduction in area will decrease from 45 per cent to 5 per cent.

Heat Treatment—Uranium base alloys can be given widely varying combinations of mechanical properties by heat treatment. There are alloy systems which form martensitic type phases upon quenching; there are other alloys which can be solution treated and aged; and finally some alloys exhibit a stable non-equilibrium phase throughout their solid state temperature range. Particularly interesting are the gamma phase alloys. These alloys are similar to an

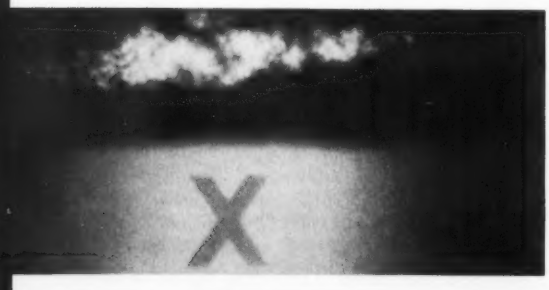

Fig. 6 — Typical radiograph of a bushing type casting made in the mold shown in Fig. 4. The X indicates the sound section of the casting

austenitic stainless steel in which the one phase structure provides excellent corrosion resistance and which has mechanical properties that are relatively insensitive to heating and cooling treatments.

A phase diagram for the uranium-molybdenum system is shown in Fig. 9. Up to three w/o Mo, a wide range of mechanical properties can be obtained by heat treating. Alpha uranium can be solution treated in the gamma range and age hardened below the eutectoid to high strengths. In the range of 3 to 5 per cent Mo the alloys are very brittle due to the presence of metastable beta phases. In the range of 7 to 12 per cent Mo the gamma phase is metastable at room temperature and below, although the phase diagram shows alpha and delta phases which form under extremely slow cooling rates.

Corrosion Resistance—The lack of corrosion resistance in many cases precludes the use of certain uranium alloys. Pure uranium corrodes in normal atmospheres at excessive rates and cannot be used unless special precautions are taken to protect it from corrosion. Proper alloying can reduce corrosion rates to very safe levels; in the U-Mo system alloys up to 7 per cent Mo have poor corrosion resistance, but the 7-12 per cent Mo alloys are outstanding for their corrosion resistance.

Summary—From this description of uranium foundry practices it is obvious that conventional foundry techniques cannot be used. In all basic considerations such as melting temperatures, pouring temperatures, solidification, shrinkage, pouring, and distortion, uranium alloys are fundamentally similar to many other alloy systems. Because of the high chemical reactivity of uranium and the potential safety hazard due to dust and radioactivity, however, uranium must be processed in uncontaminated vacua to produce castings of high soundness and ductility.

The contaminants normally encountered, such as carbon, oxygen, nitrogen, hydrogen, and silcon must be measured in parts per million if castings of uniformly high mechanical properties are to be obtained. As greater demands are made on structural materials and designers require the utmost of metal parts, it is likely that the elaborate procedures required for manufacturing high-quality uranium castings will be used in the manufacture of high-quality castings of other structural alloy systems.

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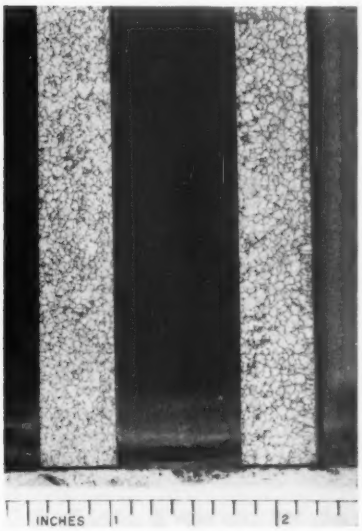


Fig. 7—A macro-etch of a coarse-grained uranium casting showing quite large crystals. Inferior mechanical properties result from these crystals

Fig. 9—Phase diagram, uranium-molybdenum system

Fig. 8—A macro-etch showing a typical example of a fine-grained casting, with crystals too fine to be distinguished with the naked eye

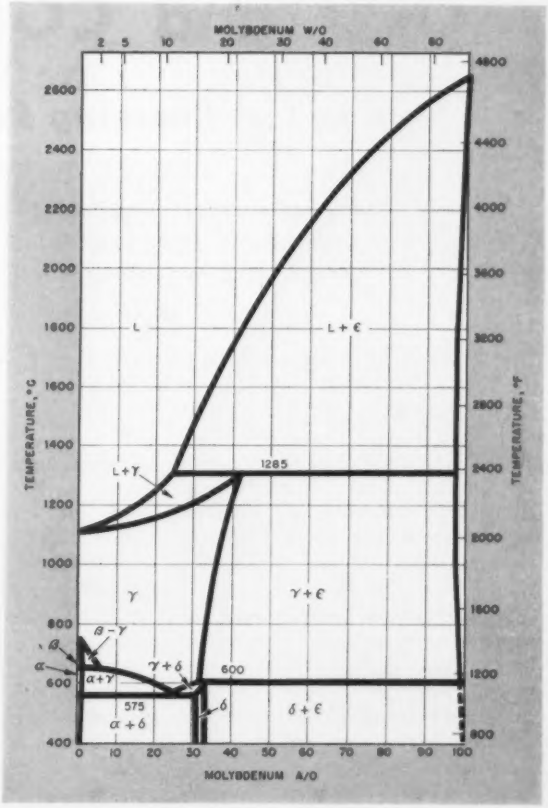


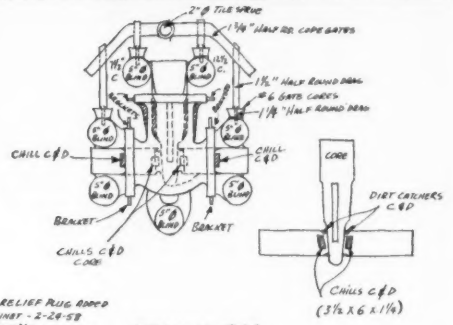
Fig. 1 (above)—Core inspector checks coreboxes daily

The Ohio Steel Foundry Co.

DESCRIPTION	CUSTOMER	PATT. NO.	CS-34600		DATE
12"-150 GATE Beop-ho.		DWG. NO.	5-CS-34600		12-13-57
WEIGHT OF ROUGH CASTING		MATCHED PATT.	FLASK SIZE	Rev.	2-24-58
WEIGHT OF HEADS		INSERT BD.	36 X 48	265 AG	
WEIGHT & SIZE OF GATE		FLOOR BD.			
YIELD		LOOSE PATT.			

HEADS AND GATES: Two 5" ø BLIND HEADS ON EACH FLANGE. ONE 5" ø BLIND HEAD ON SEAT BOWL WITH 2 OPENINGS.
FACE CHILLS COPE AND DRAG PORT FLANGES.
2" ø TILE SPRUE WITH 1 3/4" HALF ROUND GATES TO 4 HEADS. 1 1/2" HALF RD. GATES TO GATE CORES WITH 1 1/4" HALF ROUND GATES UNDER GATE CORES INTO HEADS.
BRACKETS AT HEAD OPENINGS - C & D - No SHOWN.

CORE PLANNING: DRY SAND DRAG CORE. GREEN SAND COPE CORE.
DIRT CATCHERS AT SEAT RINGS AS SHOWN.
3 1/2 x 6 x 1 1/4 CAST CHILLS ON SEATS - C & D.
FOUR #6 GATE CORES.


2" ø TILE SPRUE
1 3/4" HALF RD. COPE GATES
1 1/2" HALF RD. DRAG
#6 GATE CORES
1 1/4" HALF ROUND HEAD
CHILL C & D
CHILL C & D
BRACKET
BRACKET
CHILLS C & D
CORE
DIRT CATCHERS C & D
CHILLS C & D (3 1/2 X 6 X 1 1/4)

CORE RELIEF PLUG ADDED IN BOWNET - 2-24-58
3/4" X 3 3/4" X-SECTION

FORM No. 886

Fig. 2 (right)—Planning sheet accompanies corebox

MOLD and CORE INSPECTION

. . . Can Cut Cleaning Room Costs

Higher quality castings begin with inspection in the mold and core departments. Ohio Steel Foundry reduced cleaning costs from 33 to 20 per cent of total shop costs through core and mold inspection

By J. W. GILLESPIE
Supervisor, Core & Shell Process
Ohio Steel Foundry Co., Springfield, Ohio

● WITH the increasing demand for higher quality in castings, it seems only logical that inspection for quality should start before the castings reach the cleaning operations.

Higher quality castings must be supplied to the cleaning department by the mold and core departments to prevent the former from becoming a point of compensation for foundry errors and, consequently, a bottleneck in the production flow. This is where a mold and core inspection program steps into the picture.

A cost survey conducted at the Ohio Steel Foundry Co. some years ago revealed that cleaning operations constituted 33 per cent of the total shop cost. It was also easily seen, by time study procedures, that the time to make a mold and its cores was relatively short compared with the time required to clean and finish the casting. Once this situation was recognized, the decision was made to institute a mold and core inspection program. This inspection program has been enlarged over the years until today it largely controls the materials and the procedures used to produce molds and cores.

Cost of cleaning operations has been reduced noticeably since installation of the inspection program; currently, it is 20 per cent of the total shop cost. Castings are moving in a more regular order through the cleaning department to the shipping dock. Time study and ac-

counting also have shown that for every dollar spent in the mold and core departments to increase quality, there is a compensating return in the cleaning operations.

The Starting Point—The first step in mold and core inspection begins with the purchased materials. The purchased sand is tested for fineness and clay content. Bentonite is given a liquid limit test in accordance with SFSA Designation 13T. Cereal binders are tested according to SFSA Designation 10T. These specifications also are entered on the purchase requisitions.

In addition to the testing of purchased materials, tests also are made daily on the mixed sand for permeability, green strength, deflection, and moisture content. Occasionally, tests are made to determine hot and baked strength. These tests for the control of sand quality assure having the proper sand for the job.

The next step in core inspection takes place in the pattern storage. Each morning all coreboxes for the next day's production are brought from the storage area to an area called the schedule bay. As shown in Fig. 1, the core inspector goes to the schedule bay each afternoon to inspect the coreboxes for points of wear, damaged spots, and dimensional accuracy. If any repairs are needed, the corebox is tagged by the inspector and the box then goes to the pattern department for the needed repair before release to the core department.

When a new pattern is released to the shop, the planning department sends two copies of a planning sheet, shown in Fig. 2, with the corebox. One copy is for the foreman and one for the inspector. This planning sheet is kept on file and, as cores are made, the inspector spot checks with the planning sheet to make sure that the proper sand is used and the chilling is correct. Fig. 3 shows the core inspector making spot checks on the results of the drying procedure. A Dietert hardness tester is used to determine the hardness of the core, and the reading is checked against previously established standards for different types of sands. For example, a reading of 90 or above on a certain type sand indicates the core is too hard and not properly dried.

Temperature Checked—Thermocouple checks are made periodically in the drying ovens, and frequent checks are made with the Pandux surface temperature thermometer to determine if there are any hot or cold spots in the ovens. By keeping the oven temperatures uniform, it is possible to promote more uniform drying. These surface temperature thermometers are inexpensive and can be distributed over racks of cores to check oven temperatures in different locations. A magnet on the thermometer permits attachment to metal racks for batch type ovens or to metal shelves for vertical type continuous ovens.

Fig. 3—Core inspector makes spot checks of the results of the drying procedure. He uses a Dietert hardness tester

Fig. 4—Pandux surface temperature thermometer used to find hot and cold spots in the oven

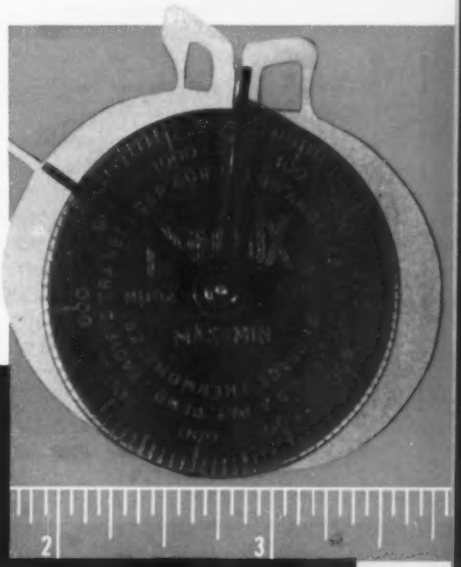


Fig. 5—Final inspection made of cores before they are sent to the molding department

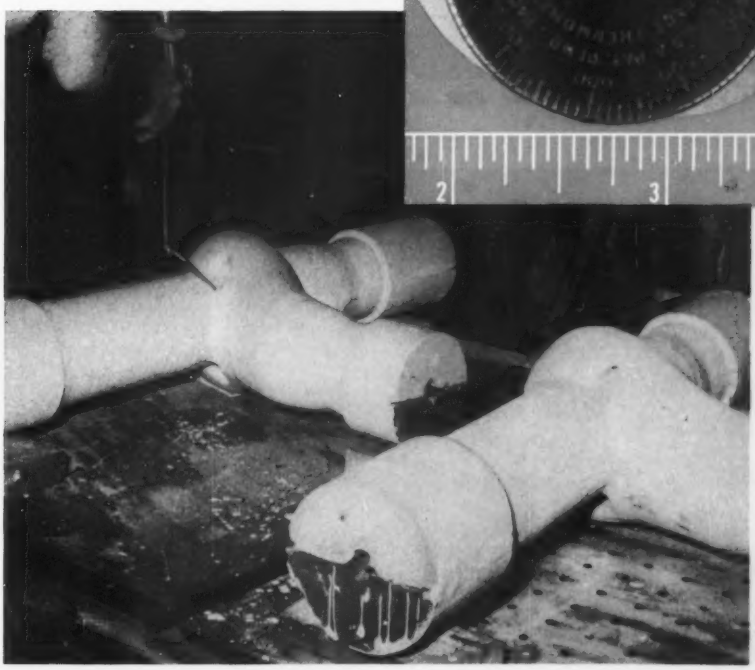


Fig. 6—Patterns are inspected for points of wear, damaged spots, and dimensional accuracy

The thermometer also can be placed directly on the cores.

Final inspection of the cores takes place at the core finish line. At this point the core dimensions are checked with gages and the cores are inspected for cracks, the fit at joint, broken edges and corners. The cores are washed, and the Baume of the wash is checked daily to make sure it meets the standard.

After the cores are washed, fired, and cleaned, they receive the final inspection. Fig. 5 shows the core inspector checking for cracks, tear drops, missed spots, and whether or not the wash is too light or too heavy. After the core is passed by the inspector, it is sent to the molding department.

It is important to note at this point that the core inspector has the authority to scrap a core at any time if he feels it is not up to standard. This tends to make the coremakers and finishers more quality conscious, since they receive no incentive pay for cores scrapped because of careless workmanship.

Procedure for Molds—Like core inspection, the second step in mold inspection takes place in the pattern storage area. Each morning all the patterns for the next day's production are brought from the storage area to the schedule bay. As shown in Fig. 6, each afternoon the patterns are inspected for points of wear, damaged spots, and dimensional accuracy. Any pattern requiring repair is tagged and sent to the pattern department for the necessary repairs before release to the molding department.

After the pattern is delivered to the molding unit, the mold inspector observes the making of the mold and checks it against the planning sheet. The mold inspector also spot checks the mold for hardness of the ram. In Fig. 7, the inspector is using a mold hardness tester to check the mold. A reading of 70 or above is acceptable on horizontal surfaces and 50 or above on vertical surfaces.

A cut-out always is made on the first mold of a new job. As shown in Fig. 8, however, the inspector can cut molds at his own discretion to check for shifts, crushes, etc. Molds and cores are checked periodically just before mold closing. Fig. 9 shows the inspector checking the drag mold for core fit and dimensions. After the molds are closed, they are moved to the pouring floor where runner cups are placed on the molds prior to pouring.

The mold inspector also has the authority to scrap a mold when he feels it is not up to standard. Here again, the molders receive no incentive payment for molds scrapped because of improper workmanship.

Preventive Action—The last, and probably the most important, phase of this type of inspection program is the feedback of information to make sure the program is headed in the right direction. This is accomplished by having the supervisor of the mold and core inspectors meet with the supervisor of the cleaning inspectors at 9:30 every morning. Here, such problems as scabs, surface bumps, crushes, dimensions, inclusions, or other difficulties that could possibly be caused by mold or core practice are

Fig. 7—Mold is checked with mold hardness tester

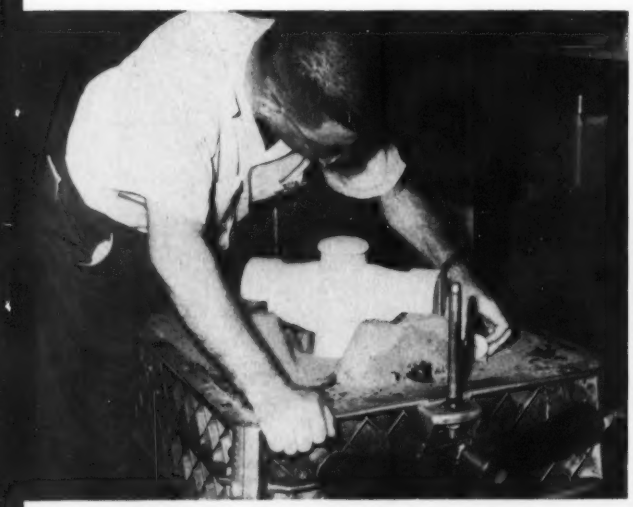


Fig. 8—A cut-out is made to check the first mold

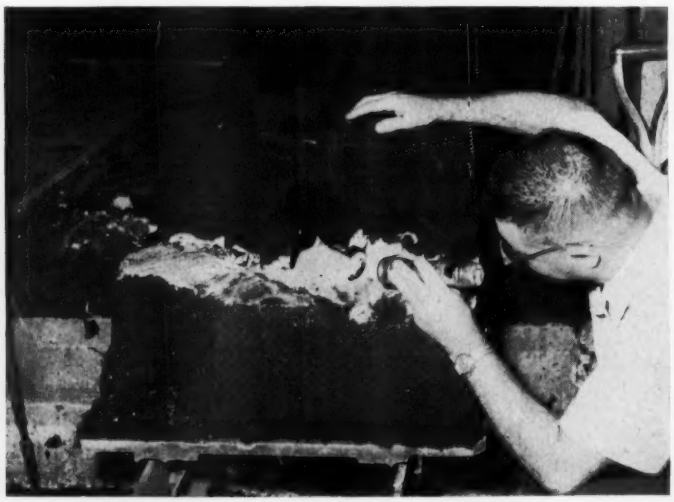
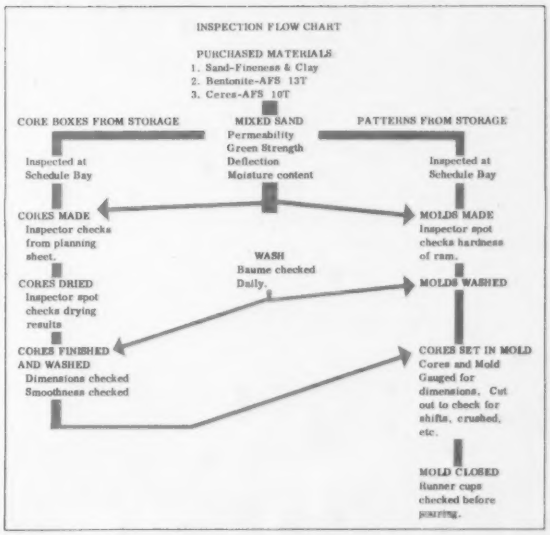


Fig. 9—The inspector makes check of core fit and dimensions of the drag mold before closing the mold

Fig. 10—Flow chart shows how inspections are made



discussed. This information is relayed to the planning committee. After investigation, steps are taken to correct the offending conditions, and new planning sheets are issued where necessary.

Frequently a check of pattern equipment is all that is needed, but perhaps a change in sand or wash or some revision in procedure may be needed. After the change is made, the job is followed closely to check the results. Fig. 10 is a simple flow chart which summarizes the line and points of inspection.

It should be noted that every mold and every core does not receive inspection of this nature. The jobs selected for this type of inspection are the ones which demand high quality and the ones which have excessive cleaning costs.

This program is not a cure-all. It has been found, however, that once a pattern has been properly planned, a great deal of little things can be done in the molds and cores to improve the casting quality. Cores and molds properly rammed, dried, finished, and washed can aid a great deal in minimizing bumps, scabbing, spalling, and inclusions.

Steps To Take—To any foundry interested in starting this type of program, the following recommendations are made:

1. Start with the control of the quality of purchased materials and mixed sand. This in itself can go a long way toward relieving foundry headaches.

2. Select two men who can read blueprints and who have a working knowledge of cores and molds.

3. Select a group of men as a planning committee to make the decisions as to what should be done with problem jobs. Once the program has reached this point, it is only a matter of selecting the most troublesome job on which to start. As soon as the first job has been satisfactorily improved, the second job can be selected, and so on, until the program is really in operation.

4. Make before-and-after cost surveys on the jobs selected to determine the benefits received.

Editor's Note: This paper was presented at the 13th annual Technical and Operating Conference of the Steel Founders' Society of America in Cleveland.

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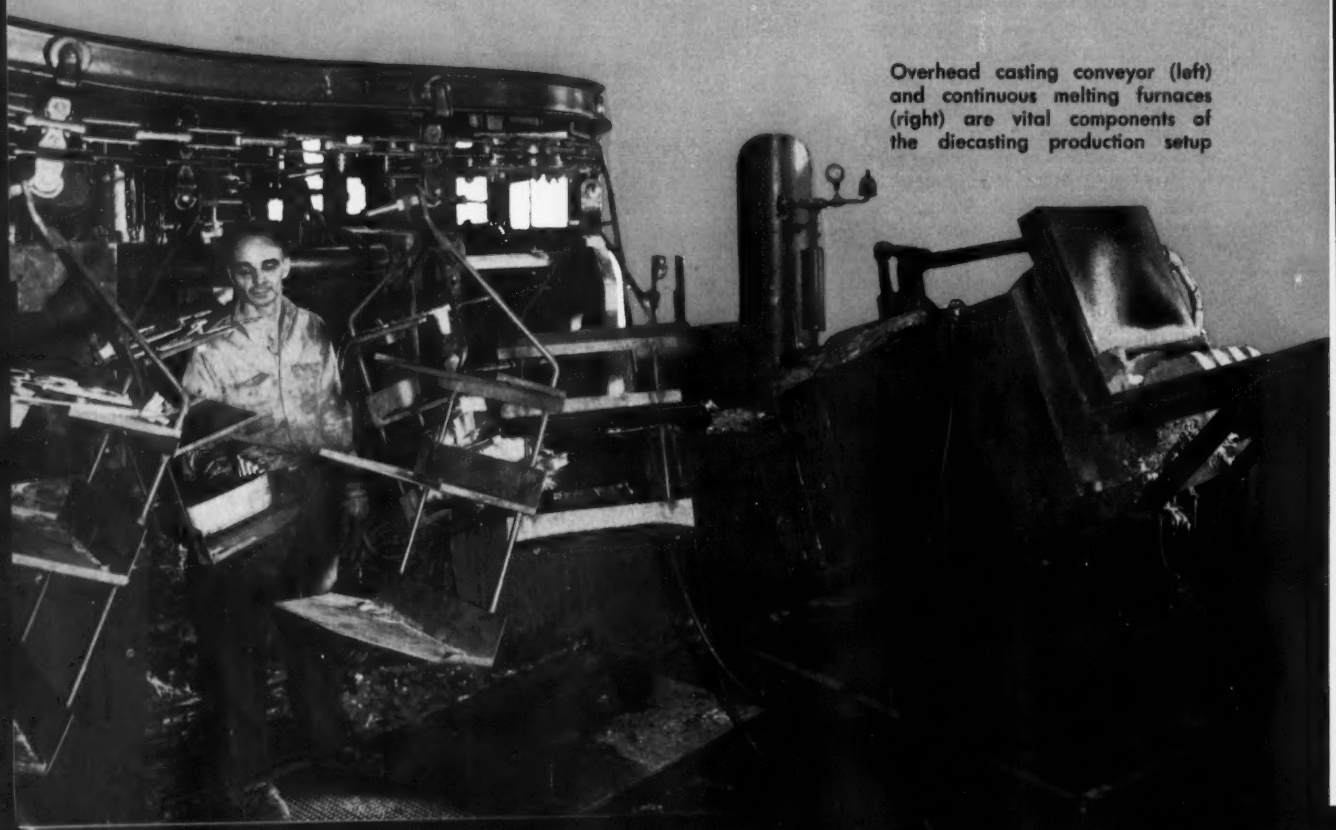
• Last month, the first of three articles in this series covered production of permanent mold castings at Monarch Aluminum Mfg. Co. This article describes production of diecastings, and the concluding article, next month, will discuss marketing of castings

An Unconventional Approach to . . .

Diecasting Production

Zinc and aluminum diecastings are produced in a wide range of sizes on 400 and 600-ton machines. Unit dies are used extensively, and other features include continuous melting and conveyorized handling

By JACK C. MISKE
Associate Editor



Overhead casting conveyor (left) and continuous melting furnaces (right) are vital components of the diecasting production setup

● THE DIECASTING DEPARTMENT at Monarch Aluminum Mfg. Co., Cleveland, is as unconventional as the permanent mold foundry, which was described last month in the first article of this series. Like the permanent mold operation, the diecasting production setup is aimed at efficient mass production of quality castings. Three features contribute particularly to the achievement of this goal: 1. Continuous melting furnaces. 2. Conveyorized handling of diecastings. 3. Extensive use of unit dies.

Of this threesome, only the furnaces are wholly a Monarch development. The conveyor system and the unit dies also are remarkable, however, because of the nature and the extent of their use and because of the manner in which they are integrated with the over-all operation. The combination of the three features provides the company with the type of facilities it requires for flexible, high-volume production.

In diecasting, as in permanent mold, the company's business is derived from nonautomotive markets which offer steady, volume production.

Aluminum is ladled from small bath (left) of continuous melting furnace which melts up to 600 lb of metal hourly

Monarch entered diecasting production in 1938, when it became one of the first integrated producers of both die and permanent mold castings. This entry was made primarily so that customers could be offered a choice of production methods. As such, the diecasting department seeks specific markets best suited to its operations and those of its customers. The aim always has been to be able to produce a cross section of customer requirements, not to compete with permanent mold operations. Consequently, the bulk of the company's production always has been in permanent mold castings.

The diecasting department is situated on the fourth floor of the five-story, 312,000-sq-ft facility and currently operates 13 machines divided between 400-ton and 600-ton ratings. The majority of these machines is used for aluminum production. Plans call for future expansion to add four or five 600-ton units as production volume increases.

Only 400 and 600-ton machines are used for a combination of reasons. Smaller machines are not employed because the company has attempted to standardize its equipment as far as possible. Extensive use of unit and multiple-cavity dies to produce small parts permits this standardization without reducing flexibility of operations. Units larger than the 600-ton machines are not used because of floor loading limitations.

Unit Dies—Extensive use of unit dies is an essential feature of the firm's diecasting operations. In this approach, a holding die block houses a group of individual cavities in which a variety of different castings can be produced in a single shot. The per-piece price of each part is prorated against the total production of the complete die, and tool cost per cavity is proportionately lower. This type of die makes possible the economical production of castings as small as a fraction of an ounce, even when the run is not particularly long. Of course, all castings made in one die must have the same composition and similar weight.

For high-volume runs of small castings, multiple-cavity dies do the job. In this instance, the holding die block houses a number of individual cavities which produce identical castings in one shot. A variation of this technique employs a number of identical cavities for one part ordered in high volume and one cavity for a low-volume part. This arrangement offers cost savings for customers who face unequal production requirements.

The importance of these techniques lies in the flexibility they make possible, as well as in the aforementioned standardization of equipment. Using only 400 and 600-ton machines with unit and multiple-cavity dies, the company can accept jobs for castings ranging from the extremely small to anything a 600-ton unit can handle. In addition, such die arrangements permit the production of shorter run items than otherwise could be taken. Successful operation of unit dies does, however, require co-ordination between the sales and manufacturing functions to assure a satisfactory product mix.

Conveyorized Handling — Conveyors of various types play an important part in virtually all parts of the huge plant, and the diecasting department is no exception.

An overhead conveyor loops in and out at each diecasting machine

station. As an operator removes a gate of castings, he merely places it on an empty fixture. If a quenching operation is required, he performs it first. Conveyorization eliminates rehandling and congestion, speeds up movement of castings, and lowers material handling costs substantially.

This conveyor eventually runs by hot inspection, where castings are degated before they are moved to the finishing departments. Aluminum gates are placed on a belt conveyor which transports them to a chute to the smelting operation. Zinc gates are placed in boxes and returned to the melting furnaces. As in the permanent mold foundry, inspectors are able to spot unreasonably large numbers of defective castings quickly and to alert operators to take corrective action.

Zinc is melted centrally in three furnaces and transported to holding furnaces at adjacent diecasting machines, as shown in this illustration

Continuous Melting Furnaces—Aluminum melting is performed with the same type of continuous melting furnace which is used in the permanent mold foundry. Individual units are situated at each aluminum diecasting station.

Like their big brothers in the permanent mold foundry, these small tunnel-type furnaces provide the advantages of quick startup, high metal quality, quick alloy changes, and flexible melting rates. Each can melt up to 600 lb per hour, enough to produce even large castings with comfortable excess capacity. They incorporate a small bath from which metal is hand ladled by the machine operator.

Only ingots are charged into these furnaces, and two men service the entire battery. As mentioned earlier, aluminum gates are remelted at a smelting unit, which is in another building, and then are cast into ingots. This metal sometimes is re-used and sometimes is sold to smelters for reprocessing.

Secondary metal ordinarily is used in diecasting operations and is purchased to certified specifications. Aluminum diecasting alloys commonly used by the company include A380, 13, A360, and 218.

Zinc Melting—Melting of zinc is done in a more conventional fashion. It is melted centrally and transported to holding furnaces at the adjacent diecasting machines. Charges consist of about two-thirds zinc slab and one-third gates. Melting is closely controlled to meet the exacting standards of the Certified Zinc Alloy Plan of the American Die Casting Institute.

Types of Diecastings—As might be expected in a jobbing shop, Monarch makes a great variety of parts in a wide range of sizes. They range in weight from fractions of an ounce in both zinc and aluminum to 5 lb (two castings in a die) in zinc and to 3 lb in aluminum.

These diecastings find applications in such differing products as small and large appliances, cameras, projectors, buses, floodlights, target guns, oil drilling equipment, light fixtures, blowers, radio telephones, office equipment, and many others. They include parts for home, industry, and military uses. Cast-in inserts are used as required to increase casting design opportunities.

Dies—Monarch's extensive toolroom facilities are used primarily in the manufacture of permanent molds. The availability of qualified tool shops experienced in machining diecasting dies has dictated the basic policy of placing die work with these outside sources. Each die is, however, completely designed in the company's engineering department to assure that the die design meets the requirements of the operating methods described in this article.

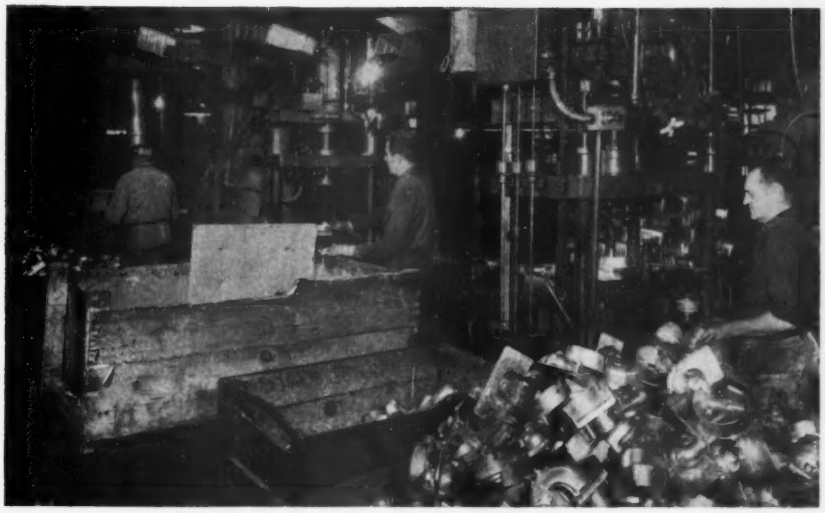
In most instances, these dies are delivered complete and require only a check out by the toolroom before initial samples are run off and checked for dimensional accuracy. Once a die has been in production, maintenance usually is performed in the toolroom; engineering changes requested by a customer also frequently can be performed in the plant.

Most of the dies consist of holding die blocks with interchangeable insert cavities. In such construction, only the insert steel is critical since molten metal never comes in contact with the holding die block. Two types of insert steel ordinarily are used.

The more common is a 5 per cent chrome type. Dies for zinc occasionally are constructed of a precipitation hardened steel which does not require heat treatment. This material is used primarily to save time in die construction, but also is useful for certain jobs to reduce dimensional distortion in the die.

When a die is constructed so that the cavity is cut directly into the whole die, insert grade steel is used throughout.

Finishing—Diecasting finishing is geared to economical material handling and mass production. Trim dies and casting dies are designed



Castings are unloaded from overhead conveyor into containers and are moved across the aisle to a line of finishing machines of many types

simultaneously to achieve the minimum amount of trimming necessary for dimensional accuracy.

Other finishing operations include wheel trimming and polishing, broaching, drilling and tapping, and special machining as required. All are performed on a mechanized, high-production basis. As is true of permanent mold castings, a great majority of diecasting receive some sort of secondary finishing before shipment.

The company's Velvaglaze finish is available on its aluminum diecastings. This finish maintains the natural aluminum surface without additives or changes in metal structure, but provides a velvety smooth finish which resists mars, scratches, and surface stains. It also is used on permanent mold castings. Zinc diecastings are prepared for plating by the customers or by an independent plating source.

Inspection and Quality Control—Diecasting inspection and quality control follow essentially the same pattern as that of permanent mold castings. Inspection begins at the diecasting machine, continues as the castings are taken off the conveyor at hot inspection, and is maintained with their movement through the various finishing operations involved. This system insures that defects which appear after secondary finishing work are discovered and corrected as soon as possible.

Because dies should produce good castings so long as they are handled properly and injected with quality metal, the company's quality control leans heavily toward good die design and careful control of metal. These precautions closely parallel those in use in the permanent mold foundry. They include spectrographic analysis, radiographic spot-checks and similar controls.

In addition to the complete metallurgical laboratory controls maintained for both die and permanent mold castings, the company also has a complete physical layout department to maintain close dimensional controls on both.

New dies, or dies on which engineering changes have been made, first are checked out in the toolroom. Immediately after the first casting shots have been made, these castings are sent to the layout department, where a complete physical layout is performed to check off every blueprint dimension. A full layout report is submitted to each plant department involved, and any corrections required are noted and performed by the toolroom or the original die source. Each item requiring correction is checked out again by the layout department on subsequent samples. Weights are checked carefully because parts are sold on a per-piece basis.

Trimming operations and any subsequent machining operations also are checked from the finished castings to assure dimensional accuracy. Trimming and machining tools and all gages used in inspection are checked periodically by the layout department during the course of each production run.

As a safety factor, several castings taken at the conclusion of each production run are sent to the layout department for a complete check. These "last-shot" reports then are used to determine any work that must be performed on the tooling before it is released for the next scheduled production run.

Next Month—The concluding article in this series will be a discussion of Monarch's comprehensive approach to the marketing of castings.

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First and last castings in a run receive a complete physical layout to check blueprint dimensions. The layout department does this job

Practical Tips on

CUPOLA CONTROL

Essential data show how cupola reactions can be controlled and how consistent results can be obtained reasonably well

By SAM F. CARTER
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● ENTHUSIASM for the more glamorous new developments in cupola operation sometimes leads foundrymen to lose sight of fundamentals that are of everyday importance. This article will review some of these fundamentals of good control. The essential data have been taken from several papers.[1, 2, 3, 4, 5]

A 24-in. experimental cupola was used at Acipco to study cupola variables, and all major principles have been verified in larger, production cupolas. Each day, we operate five cupolas—ranging from 28 to 84 in. in diameter—with melt rates from 2 to 45 tons per hour—and melt widely varying charges for several analyses. Basic linings are used in one regular 36-in. and one part-time 84-in. furnace.

The principal objectives in cupola melting are the following: 1. A predictable and consistent volume of iron. 2. Adequate metal temperature for the castings poured. 3. Controlled composition to give satisfactory properties in the metal.

For good chemical control, three main reactions must be controlled—sulfur absorption, carbon pickup or loss, and silicon loss by oxidation.

Inside the cupola, many reactions take place. There is a struggle for equilibrium or chemical balance within the short periods of gas, liquid, solid, contact. Complete understanding of these reactions would challenge the physical chemist.

Through experience and a few experiments, however, we have learned that by following a few rules we can control these reactions and obtain consistent chemistry reasonably well. It is our purpose here to review some of those rules.

Coke Composition—Since coke is the center of reactivity in the cupola, coke composition and structure are most influential. MacKenzie did much experimental work on various cokes. One of the tests which he made consisted of repeated remelting to determine equilibrium carbon and sulfur contents.

Fig. 1 shows the effect of ash content of several cokes on carbon equilibrium. Some obvious deviations indicate that ash composition is not the only factor in coke structure which affects carbon pickup.

However, a general trend of decreasing carbon with increasing ash seems evident. With ash contents below 2 per cent, carbons near 4.00 per cent were obtained. With ash contents of 15 per cent, equilibrium carbons of 2.70 per cent were obtained. Of course, malleable producers want low carbon, and some buy special higher ash cokes.

Coke also is a predominant factor in the sulfur equilibrium. Fig. 2 shows how higher sulfur cokes tend toward higher metal sulfurs. Average cokes of 0.60-1.00 per cent S tend toward an equilibrium of 0.120 to 0.160 per cent sulfur metal, whereas a low sulfur coke of 0.40 per cent stops at 0.080 per cent S, and a high coke of 2 per cent S will

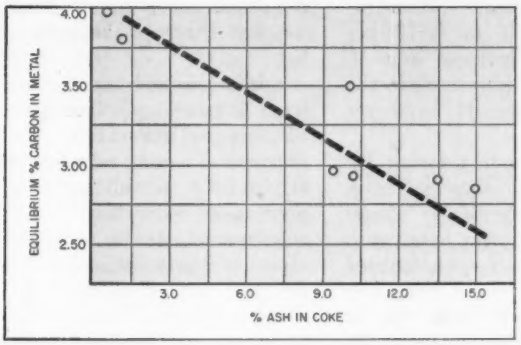


Fig. 1—Effect of coke ash on equilibrium carbon

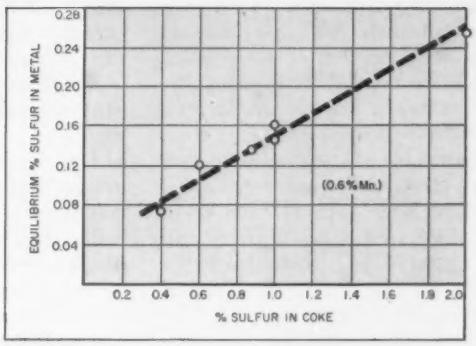


Fig. 2—Effect of coke S on equilibrium sulfurs

go to 0.260 per cent sulfur metal.

Here again, many other factors can contribute extra sulfur—for example, high sulfur scrap, poor fluxing practice, and excessive oxidation. Manganese level also affects sulfur content. With a good charge, however, coke is the principal source of sulfur, and low sulfur metal cannot be produced from high sulfur coke in an acid cupola.

Coke producers have made commendable progress toward improved coke for gray iron, but ductile iron has presented a challenge to foundrymen and to coke producers. The real key to making graphite precipitate in nodular form is the elimination of sulfur. If we had sulfur-free coke, ductile iron could be made readily in an acid cupola with good efficiency. If we had lower sulfur coke, the basic cupola would not be such a problem. The main control problem is to maintain a highly basic slag for desulfurizing without excessive carbons. Such a low sulfur coke might require beneficiation, alteration of ash composition, or some revolutionary principle in coke production.

Carbon Solubility—Sulfur content also influences carbon solubility in iron and has an indirect influence on gray iron. High sulfur iron will not absorb as much carbon as low sulfur iron. Fig. 3 shows results of induction heats on which sulfur level deliberately was varied and the bath saturated with an excess of carbon at five sulfur levels.

At 0.270 per cent S, carbon could not be dissolved above 3.00 per cent. At 0.140 per cent S, maximum carbon was 3.70 per cent. With a very low sulfur of 0.030 per cent, carbons near 4.20 per cent were obtained readily. On one low sulfur saturated heat, sulfur was added and went into solution easily to a 0.230 per cent level. This result verifies the fact that sulfur will keep out carbon, but carbon will not keep out sulfur.

On the basis of the usual carbon equivalent formula, carbon equivalents of 4.80 were obtained on the low sulfur, whereas equivalents with the high sulfur contents were below 4.00.

This fact explains why high carbon contents are hard to maintain when high sulfur coke is used or large proportions of scrap are melted. It further explains why basic cupolas running very low sulfurs can produce some carbons above 4.00 per cent.

Coke Size — Another important factor is coke size. Size and size distribution of coke determine the area of coke surface exposed as well as the permeability of the bed and the velocity of air through the coke.

To determine the effect of coke size, experimental heats were run with identical charges and practices on 5 different sizes of the same car of coke within a single screen range, as shown in Fig. 4.

To determine the effect of size distribution, heats were run on six different synthetic mixtures represented by from two to five screens. More extensive data are available in the literature.[1]

The solid circles are uniform, one-screen coke. The other figures represent two to five-screen mixtures. When plotted against average diameter, the mixed sizes fell in line reasonably well.

Maximum temperature was obtained when coke size ranged from 8 to 15 per cent of the cupola diameter. Lower temperatures were obtained with very small coke and with coke as large as more than 20 per cent of the cupola diameter.

Carbon pickup followed the same trend. It reached a maximum with intermediate coke size and dropped down when coke was too small or too large.

Sulfur showed a slight increase with finer coke, apparently because the same bed height has the effect of a higher bed with small coke.

Fig. 5 shows that manganese and

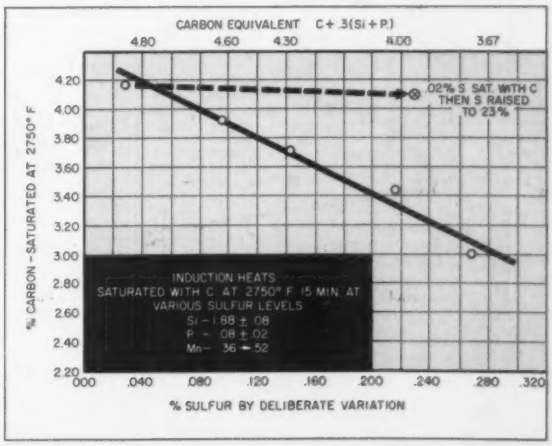


Fig. 3—Chart shows the effect of sulfur on carbon solubility, the results of induction heats in which sulfur level deliberately was varied and the bath saturated with an excess of carbon at five sulfur levels

silicon losses are lowest with coke of intermediate size and increase with both small and large coke. Iron oxide content of the slag follows oxidation loss closely, increasing with both small and large coke.

Reasonable mixtures of coke sizes gave good performance provided that the sizes were not too small and the spread not too great. All the mixtures with coke 1½ in. or less or with four or five sizes caused considerable bridging.

These effects of coke size have been verified in our production cupolas and by other plants. Cars of small coke on our large cupolas have caused lower temperatures and lower carbons unless some adjustment was made. Our 28-in. production cupola, for example, does not operate properly on the large coke used in our 84-in. unit. For this 28-in. cupola, we buy 2 to 5-in. coke. For 36 and 48-in. cupolas, we buy 3 to 7-in. coke. If coke is broken to size for smaller cupolas, fines may accumulate. Used accidentally, they will bridge over the small cupola completely. On smaller cupolas, coke can be too big, but on larger cupolas hardly can be too large. It usually is too small. Excessive breakage in handling usually results in a decrease in efficiency.

Amount of Coke—Fig. 6 shows the effect of varying coke ratio. On 24-in. cupola heats, identical charges of 50 per cent steel were run with the same air volume—900 cfm. As coke increased from 9 to 20 per cent, carbon increased from 2.85 to 3.10 per cent. Sulfur increased from 0.081 to 0.110 per cent, silicon loss decreased from 18 to 8 per cent, and iron oxide in the slag decreased from 11 to 4 per cent.

Fig. 7 shows that pressure increased slightly with increased coke; melting rate decreased to almost half. Temperature was lower with the low percentage of coke, reached a maximum around 14 per cent, then declined again with the 20 per cent coke. The details apply, of course, only for a small cupola at a given air rate and with this particular type of charge, but the principles are general.

Tests also showed that more coke (with sufficient air) produces hotter iron, but slower melting. More coke is needed for smaller cupolas for equivalent conditions. On large cupolas, with which iron temperatures of 2500-2600° F are sufficient, high melting rates can be obtained with metal-to-coke ratios as high as from 12:1 to 16:1. Where temperatures of 2700-2800° F are needed, more coke is required, and metal-to-coke ratios usually vary from 7:1 to 10:1. On very small cupolas requiring still hotter iron, a ratio of 5:1 sometimes is required, especially on high steel charges, which absorb some carbon.

If the proper amount of coke is charged consistently, iron temperature, iron analysis, and melt rate should hold reasonably constant throughout the day. A drift in one direction or the other indicates too much or too little coke. Fluctuations indicate irregularities in coke weights, charge makeup, or charging.

Additional or booster coke sometimes is necessary to correct cupola ills, but its frequent use indicates improper charging or other irregularities. On a well controlled operation, no more than one or two regular coke changes should be necessary within a day. The need for frequent manipulation of coke weights indicates that some other factors are not under control.

Coke is cheaper than misrun castings, high oxidation losses, or premium charge material, but extra coke frequently is used to compensate for poor practice. Such "ignorance" coke is expensive.

Coke should be weighed more closely than the metal since 10 lb of coke usually are equivalent in effect to 100 lb of metal. Scales must be checked frequently with standard weights. Tare weights are, because of accumulation of mud and dirt on weigh hoppers or buckets, of particular importance.

Air Volume — The other major factor in combustion is air. Fig. 8 shows the physical effect of three volumes of air, one very low, one optimum for the size of cupola concerned, and one admittedly excessive. As expected, pressure increased and melting rate more than doubled. Temperature reached a maximum, verifying that thermal efficiency is improved by properly proportioned air and coke.

Fig. 9 shows the effect on the reactions within the cupola. Carbon

Fig. 4—Graph shows the effect of coke size on temperature, carbon, and sulfur

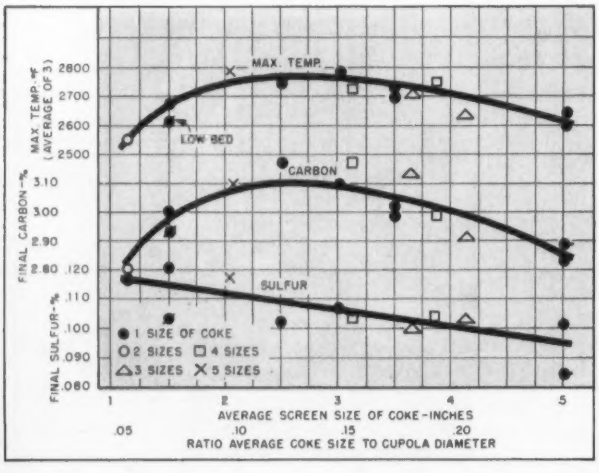
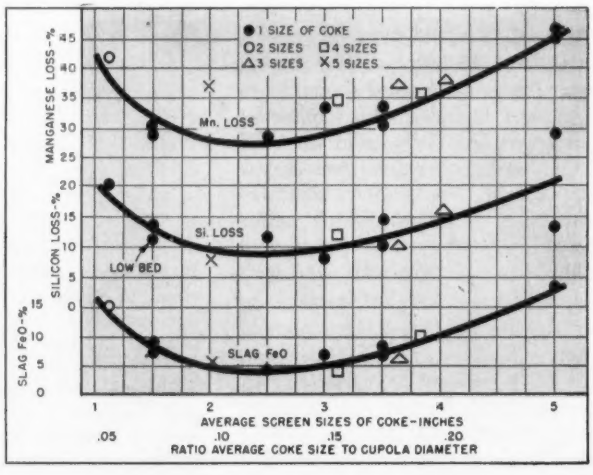


Fig. 5—This graph illustrates the effect of coke size on oxidation losses



showed a slight decrease, from 3.14 to 3.07 per cent. Sulfur showed no significant change. Silicon loss showed a great increase with blowing too hard—from 7 and 9 to 31 per cent. Oxidation further is indicated by the sharp increase in slag FeO from 5 and 6 to 15 per cent. Air is the heaviest raw material and deserves careful measurement and consideration.

With differing air volumes, the melting rate of a cupola can be varied considerably and controlled reasonably well by adjustment of bed height and tuyere area. If air volume must be increased considerably, it can be raised best in successive steps or with additional coke scheduled to reach the bed at the time of the blast increase. Insufficient blast gives poor penetration and loss of efficiency. Blowing a cupola too hard causes excessive oxidation, increased refractory attack, and an increased tendency toward many other cupola ills.

Charge Distribution — Proper charge distribution and stack permeability are necessary for proper air distribution over all areas of the cupola. Side dump charging tends to dump small, dense material on the near side and roll large, looser material to the far side.

Best efficiency results when coke and denser materials are charged against the periphery and looser materials toward the center. Cone-bottom buckets tend to give this pattern, which encourages air penetration to the center of the stack.

Bed Preparation — One of the most critical aspects of cupola operation is bed preparation. Inadequate supervision can lead to trouble that can last for several hours. Bed coke should be sized carefully, and fine coke that will fill in air spaces and restrict air penetration should be avoided.

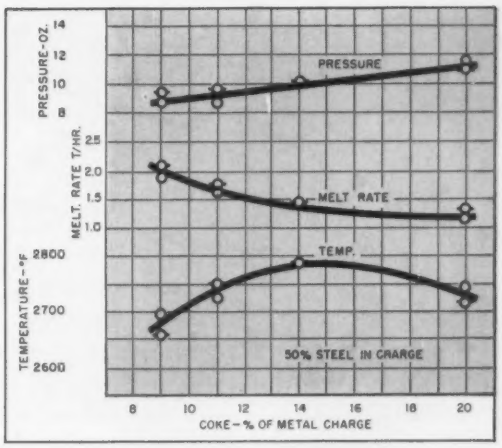


Fig. 6—The effect of varying coke ratio on metal chemistry. As coke increased, carbon and sulfur increased

Coke can be lighted by any one of several methods provided that the lowest coke in the corner of the basin is burned. Without special care, this dead rim of coke receives no flame or air. The purpose of wood cones, special igniters, lighting through tapholes, light-off tuyeres, and other methods is to be sure that the very bottom layers of coke are preheated. If the lower basin coke is not burned, it can take temperature from the first iron for several hours.

Bed coke can be brought up to temperature in a number of ways, provided that it is burned evenly. Natural draft is easy to control; the same number and sequence of tuyeres are left open each day so that the draft is the same. Forcing a bed by hard blowing can be dangerous. Blowing of the bed should be limited to a few minutes at greatly reduced blast.

If bed practice is consistent, a weighed or measured quantity of coke should give a consistent bed height after burning in, allowing a few inches for adjustment.

Before a cupola is filled, the color of the bed should be checked and the height measured. If the bed is insufficiently burned, more time should be allowed or it should be given additional blowing at low air volume. If the bed is low, it should be adjusted. Proper bed height is important, but high beds should not be given extra "rodding" or hard blowing just to get the right measurement. Such methods of getting the bed down are more detrimental than a high bed.

Bed Height — Satisfactory bed heights usually are from 40 to 60 in. above the tuyeres. Beds on the higher side are required for large diameter cupolas, hotter iron, and high steel charges. Higher blast rates also require higher beds. It is just as important to bring a cupola in on the same air volume as on the same bed height. A 5-oz variation in air pressure is equal to roughly 5 in. of bed height.

With the proper bed height, drops of iron should be visible in the tuyeres within 8 to 10 minutes after the blast has gone on, depending on the type of iron being melted. If a cupola comes in fast and cold, the bed probably is low and should be increased for the next day. If the cupola comes in slow, the bed probably is unnecesarily

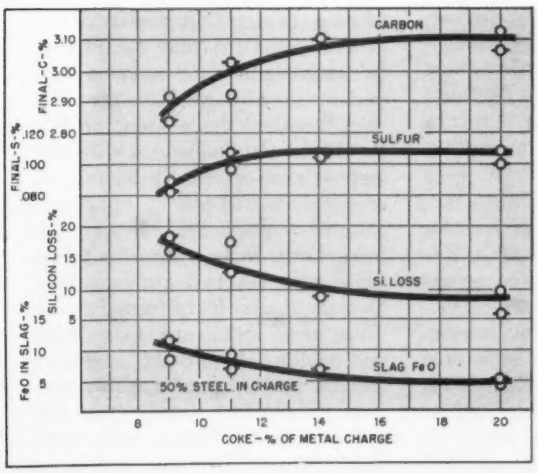


Fig. 7—The effect of varying coke ratio on pressure, melt rate, and temperature. The pressure increased and melting rate decreased

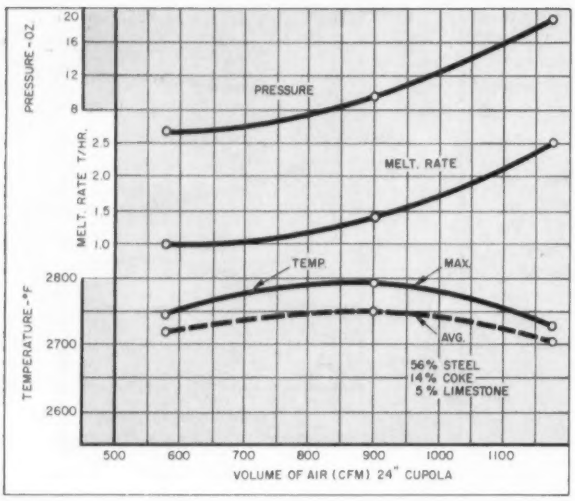


Fig. 8—Graph shows the effect of air volume on pressure, melting rate, and temperature

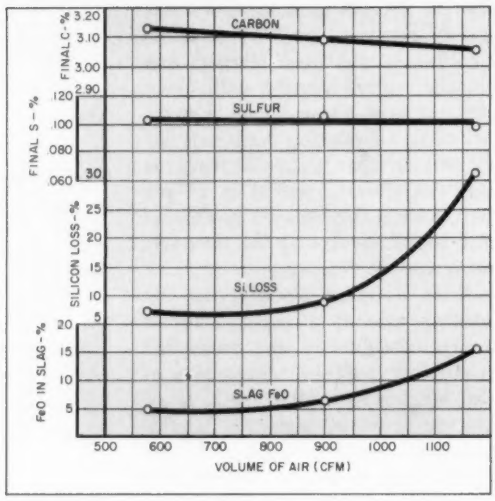


Fig. 9—Illustrated here is the effect of air volume on metal chemistry within the cupola

high and should be lowered.

Type of coke, coke size, size and type of charge material, method of charging, and other factors can affect the effective bed height. For that reason, optimum bed height can be determined best by scientific trial and error and hardly can be formulated for every operation.

A cupola should "come in" on a consistent time schedule from day to day if various factors of bed practice are properly controlled.

Scrap Size and Shape—Another factor influencing internal reaction rates is the variation in composition and shape of steel and cast scrap. Steel scrap is particularly subject to wide variations in form and chemistry. As shown in Fig. 10, we have made experimental melts of 50 per cent steel with 1-in. thick plate, 3/8-in. plate, 3/16-in. plate, and tin cans. As the plate became thinner and the ratio of surface area to volume increased, sulfur absorption increased, silicon loss increased, and slag FeO increased.

These increases were especially obvious with the tin can melts, from which a very large volume of high FeO slag had to be disposed of. Steel scrap thinner than 1/4 in. should be avoided because of excessive oxidation. Likewise, several heats were run with cylindrical steel in several diameters. These did not show the chemical variation of the plate, but melting was retarded and the temperature lowered by some small rivets. Rivets and punchings reduce stack permeability too much and tend to choke the cupola.

At the other extreme, steel scrap can be too large. Bars 3 in. in diameter lowered temperature and melting rate in the 24-in. cupola, for example. Heavy steel shafts easily slip to the bottom of steel scrap, too.

These results show that all steel scrap does not behave alike, but does follow a reasonable pattern.

In earlier years we used only select steel scrap like rails. As we were forced to use various types of steel, we ran into unexplained variations until we made a study of steel scrap. At the present, most of our high steel mixes include allowances and adjustments for various types of steel.

Slag Control—In the conventional acid cupola, the slag is not expected to accomplish any refinement and usually is considered a necessary evil, to be eliminated as conveniently as possible. Actually, however, cupola efficiency and iron analysis can be affected by fluxing practice and slag composition.

Major sources of slag are the following: 1. Cupola lining. 2. Coke ash. 3. Oxidation products. 4. Extraneous sand and mud on scrap. These are predominantly acid in nature and form a gummy, viscous slag. For that reason, a basic flux like limestone or dolomite is needed to fluidize slag and keep the cupola clean and open.

Properly fluxed slag leaves the coke clean for efficient combustion and flows freely from the tap hole and down the slag trough. With insufficient flux, a viscous gummy slag can back up in the cupola, close interstitial spaces in coke, bridge over the tuyeres, and cause the most serious of cupola troubles. Excessive flux is corrosive to acid refractories and dangerous from the standpoint of runouts, but produces higher carbons and lower sulfurs.

We ran a number of experimental acid heats with identical charges of 70 per cent steel and the same practice. Flux was varied over a wide range, with some extremes. With changes in the flux only, carbon contents were varied from 2.40 to 3.10 per cent. Sulfur content ranged from 0.140 to 0.070 per cent.

In an acid cupola, the aim usually is for the minimum flux for satisfactory fluidity. Iron analysis and general operation may be affected by slag variations, however, especially on high steel charges. For these reasons, the amount of flux should be determined as carefully and weighed as closely as that of any other ingredient.

Large cupolas with lower coke proportions may operate satisfactorily with 1 1/2 to 3 per cent flux. Cupolas under 48 in. usually consume more lining, use more coke, and require 3 to possibly 7 per cent flux for good operation. The wise cupola operator watches the size and quality of his stone, makes sure flux is evenly distributed, and keeps

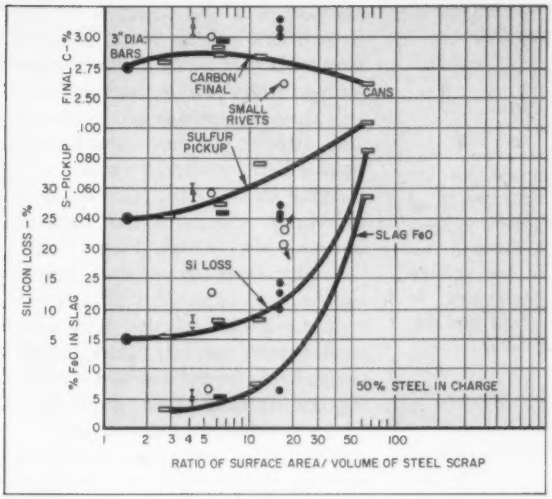


Fig. 10—Effect of variation in composition, size, and shape of steel and cast scrap

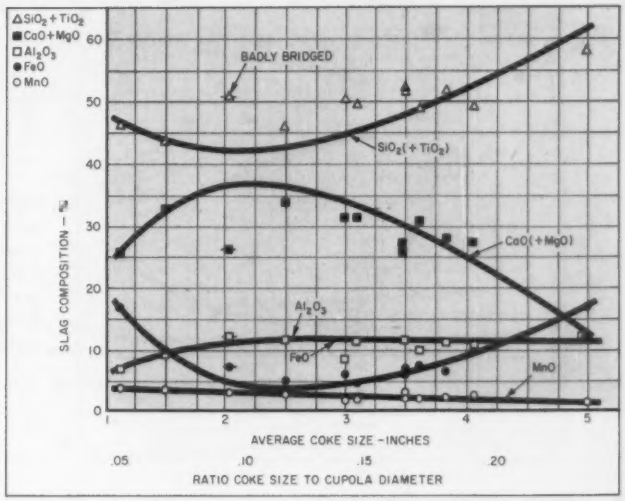


Fig. 11—The effect of coke size on slag composition and the amount of flux necessary

one eye on his slag fluidity down the trough as well as slag color at some standard location. If slag becomes sluggish, he immediately checks the flux practice. If it is in order, he looks for abnormal sources of slag.

Poor lining practice can create problems with a normally good slag. Any poor workmanship or material in the lining goes into the slag, causing the regular flux to be temporarily insufficient. Good lining practice is most important for good slag control and good cupola practice, especially on smaller cupolas and high steel mixes.

Extraneous dirt on charge material also may cause a stiff slag and cupola troubles. When bins are low in rainy weather, considerable mud and dirt may adhere to scrap. Extra flux should be added temporarily if such conditions cannot be avoided.

Stone Size and Cleanliness — Limestone size should be within ½ to 3 in. and preferably ¾ to 2 in. Small stone is blown out, and large lumps do not break down and react in time to do the fluxing job properly. Good stone should be free of sand and shale, with the silica content below 2 per cent. Storage and handling should be such as to keep out dirt and sand.

Just as slag condition affects operating conditions, various operating conditions tend to affect slag composition and the amount of flux necessary. Fig. 11 shows the effect of coke size on slag analysis.[2] The best composition, with lowest SiO_2 and highest lime, was obtained with optimum coke size. With both small and large coke, SiO_2 content increased because of greater oxidation and lining attack. Lime content decreased because of dilution. Iron oxide content increased at both extremes.

Fig. 12 shows the effect of air volume on slag composition. Increasing air volume to extremes increases SiO_2 and FeO and decreases CaO. The best slag composition corresponds with best cupola performance. Our objective is to melt good iron, not good slag, but slag composition sometimes points the way to good operation.

The Basic Cupola—Slag composition leads naturally into a review of basic cupola operation. Shifting the slag to a predominance of basic constituents results in lower sulfur, higher carbon, and higher silicon loss. This shift can be accomplished by substituting a basic or neutral lining in the melting zone and basin.

Fig. 13 shows a comparison of acid and basic slags with the sources of the constituents indicated at the bottom.

Silica is the principal acid constituent and comes from acid lining, coke ash, and oxidation of silicon. It ranges from 46 to 52 per cent in acid slags. Lime and magnesia are the basic constituents. The basicity ratio (lime and magnesia over silica) is 0.6 to 0.8 in these acid slags, which are glassy and greenish black.

In basic operation, acid contribution from the lining is absent, and basic refractories from the lining add to the basicity. Consequently, silica contents of basic slags run lower (36 to 16 per cent), and lime and magnesia contents much higher. Basicity ratios range from 1.5 on a brown, mildly basic slag to 2.3 on a gray slag of medium basicity and 4.6 on a highly basic, white, disintegrating slag. A basic cupola can be operated at any level of basicity, depending on the sulfur level and carbon content desired.

Fig. 14 shows three basic heats melting the same charge of 100 per cent return scrap, varying the flux from 3 per cent limestone and ½ per cent fluorspar to 4 per cent stone and ½ per cent fluorspar and to 6 per cent limestone and 2 per cent fluorspar. Basicity ratio of the slag increased from 1.42 to 1.88 as color went from dark to light brown. Sulfur in the metal decreased from 0.069 to 0.022 per cent because sulfur in the slag increased from 1.46 to 0.7 per cent.

Fig. 15 shows how flux can be increased so that from 35 to 80 per cent steel can be used to produce the same 3.40 per cent C iron.[3, 4]

With an acid lining, 30 per cent steel and 4 per cent limestone were used with a 15 per cent Si loss and an average of 0.090 per cent S. A basic lining with no flux was not

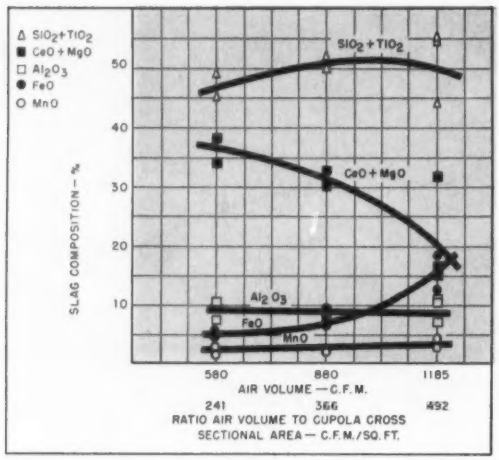


Fig. 12—The effect of air volume on slag composition. Extreme increases in air volume produce increases in SiO_2 and FeO and decreases in CaO

much different from acid operation. With 2 per cent limestone and a more basic slag, 50 per cent steel has been used with a final sulfur of 0.060 per cent.

With 4 per cent limestone plus 1 per cent carbide and 1 per cent fluorspar, 80 per cent steel has been used with a final sulfur of 0.030 per cent. As flux and basicity were increased, silica loss increased, carbon pickup increased, permitting more steel, and sulfur decreased. Usually a mildly basic practice is used on gray iron and a medium to high basicity on ductile iron.

The examples illustrate three major applications or advantages of the basic cupola: The ability to melt very low sulfur iron, the use of high proportions of return scrap or marginal raw materials with good sulfur control, and the use of high proportions of steel scrap with high carbons and low sulfurs.[5]

This flexibility does not, however, come without price. Basic refractories are considerably more expensive than acid, and higher silicon losses must be considered. Basic operation is more sensitive than acid and requires closer supervision.[3, 4, 5] The basic cupola has established a definite place in ductile iron production, and other applications depend on the raw material picture in relation to the iron needed.

Lining Repair—In both acid and basic cupolas, refractory practice is one of the most critical of cupola controls. Unfavorable contours, humps, etc., can cause hangups and irregular charge descent. Uniform tuyere openings and a slight overhang over the tuyeres are important for good air distribution and open tuyeres. Without routine measurements, it is easy for linings to become out of round, off center, or unfavorably contoured.

Consumed lining goes into the slag and affects its composition. A poor lining that falls out or melts out abnormally can cause slag trouble and a sick cupola. Such troubles can be caused by poorly fitted brick, excessive moisture, or soft blowing of gun material. Good gun performance is necessary for a good dense lining. We patch with pneumatic guns in our plant, and this practice is typical in our industry.

A wise operator checks and measures the cupola lining after each heat to note burnback and any weak spots. He also checks after lining repair to be sure of dimensions, contour, and lining quality. Close attention to the basin and bottom sand is necessary to prevent runouts. Good technique on the taphole and the slag trough are important to prevent tapout troubles and costly delays.

Dam Height—Dam height is important in front slagging. The distance from the top of the taphole to the iron dam should be maintained consistently at a distance established for the highest blast pressure expected. The height of the metal dam and slag notch should be measured every day and the taphole held at the same level. Proper dam height depends on cupola pressure. If the dam is too low, air will blow out of the taphole, oxidize the iron, and attack the breast. If the dam is unnecessarily high, more slag is held in the cupola. If it is extremely high, slag may back into the tuyeres on a shutdown. If slag level in the cupola is too high, it may be chilled by incoming air and form a bridge under the tuyeres.

If these dimensions are controlled and cupola practice is properly standardized, a cupola should start slagging on the same time schedule every day. Early or late slagging indicates low or high dams.

Bright, Open Tuyeres — Bright tuyeres are a sign of a healthy cupola condition and the pride of a good cupola operator. Dark, partly clogged tuyeres indicate some bridging and nozzling of air, a condition which can lead to poor operation.

Slag must be prevented from backing up into the tuyeres by good slagging practice and prevention of viscous slags, which tend to lag behind. Good charging and all the essentials of a balanced practice are necessary to minimize bridging caused by chilling of slag falling past the tuyeres. The tendency to bridging and clogged tuyeres is worsened by overblowing, small coke, improper fluxing, uneven charging, poor lining practice, etc. On small cupolas, even closer attention is required to maintain clean tuyeres. Basic cupolas tend toward brighter, cleaner tuyeres. Hot blast cupolas maintain brighter tuyeres because of less chilling by the preheated air.

One of the most effective methods of keeping tuyeres open is by a systematic rotation of tuyeres where good valves are available. Closing a tuyere for a short period allows the heat to melt out chilled slag. "Rodding out" or use of special fluxes or oxygen will open up a tuyere temporarily, but will not correct the basic trouble.

Scrap Condition—Scrap must be watched closely by a wise cupola operator. Thin, burned scrap may cause excessive oxidation and off-analysis iron. Heavy pieces of steel melt improperly or incompletely.

Nonmagnetic metals and materials with white fractures contain alloys which should be avoided. Lead, bearing metals, aluminum, pot metal, and various metals that do not rust should be avoided because of the detrimental effect of tramp elements. Sulfur impregnation through deeply burned scrap and certain types of rubber should be avoided to prevent high sulfur absorption.

Tests and Records—Temperature readings at regular intervals serve as a valuable indication of cupola performance. A reasonably consistent stream temperature indicates good cupola conditons and control. Temperature variation of more than 50 degrees Fahrenheit from normal suggest irregularities that should be investigated.

Chill tests made at regular intervals give a fast and inexpensive indication of cupola consistency. Erratic chills should be investigated.

Good records are important. We use a cupola data sheet which we think contributes toward a better controlled operation. The sheet records a great many facts about operation of the cupola and shows any dangerous trends.

Summary — This discussion has been intended to lead to the following general conclusions:

I. Cupola operation need not be a mysterious art; it can be made a controlled science.

II. By recognizing, isolating, and studying individual variables in the process, we can determine the effect of each on the reactions affecting successful performance.

III. Once the right principles have been established, success depends on their application by the men on the cupola.

Our Ten Commandments of good cupola operation are as follows:

1. Consistently use the quality of coke best suited for the objectives.

2. Proportion coke sizes to cupola diameter (10-12 per cent seems best), with proper handling and elimination of very fine coke.

3. Use the coke ratio which provides the best combination of output, temperature, and chemistry for the castings poured.

4. Keep volume within a range satisfactory for the cupola size and mix, avoiding extremes of under and overblowing.

5. Prepare the bed in a consistent manner; light and burn it so that every day the same weight of coke gives a consistent bed height and the cupola comes in hot on a consistent schedule.

6. Control size and shape of steel scrap and adjust for variations in chemistry and size, with close attention to contaminating elements in cast scrap.

7. Employ proper fluxing and slag control—that is, use low silica and clean stone; add a consistent amount of flux calculated to give slag of proper composition and adequate fluidity; and control irregular sources of dirt, oxidation, and refractory consumption, which can cause slag variations.

8. Charge evenly with a distribution that encourages air penetration to the center of the stack.

9. Remember that good operation starts the day before with good lining repair, which gives consistent shape and dimensions and sound refractory surfaces that do not fall out or burn out abnormally and do not affect slag composition adversely.

10. Keep adequate tests and good records which accentuate the elements of good control, provide operators with pride in good practice, and give supervision prompt indications of abnormal trends.

Fig. 13—CUPOLA SLAG ANALYSES—ACID & BASIC

	ACID	BASIC					Basicity	
	SiO_2	CaO	MgO	Al_2O_3	FeO	MnO	Ratio	Color
ACID SLAGS								
Viscous	52.1	29.2	0.9	12.4	1.5	1.9	0.6	Glassy, green black
Avg. Fluidity	46.2	37.2	1.0	11.0	1.1	1.4	0.8	
BASIC SLAGS								
Mildly Basic	35.1	35.0	16.8	7.8	2.2	1.7	1.5	Dull brown
Medium	26.0	32.6	28.6	9.2	2.9	0.6	2.3	Dull gray
High basicity	15.8	64.3	8.6	15.2	0.2	0.1	4.6	White powder

SOURCES: Acid Lining, Coke Ash, Oxidation; Basic Lining, Flux; Ash, Ref.; Oxidation

Fig. 14—EFFECT OF FLUX ON SLAG-METAL RELATIONS

Same Metal Charge—100% Return

Flux Charge	Slag Composition SiO_2	Al_2O_3	FeO	MnO	CaO	MgO
1. 3% Limestone	35.4	10.1	1.9	1.9	34.1	16.2
2. 4% Lst., .5% Sp.	32.4	11.7	1.2	0.6	39.0	15.1
3. 6% Lst., 2% Sp.	30.6	7.8	0.7	0.8	42.3	15.2

	Metal Sulfur	Slag Sulfur	Basicity Ratio	Slag Color
1.	.069	0.46	1.42	Br. Blk.
2.	.051	0.62	1.67	Med. Br.
3.	.022	0.7	1.88	Light Br.

Fig. 15—BASIC MIXES WITH VARYING SLAG BASICITY

Same Final Chemistry—2.00 Si, 3.40 C, 0.20 P

Flux.	% Steel	Si. Loss	C Pick up	S Final
ACID 4% Limestone.	30%	15%	0.45	.090
BASIC None.	35%	20%	0.65	.075
1% Limestone.	40%	24%	0.85	.070
2% Limestone.	50%	27%	1.25	.060
4% Limestone. ½% Sp.	60%	30%	1.60	.050
1% CaC_2, 4% Lst., 1% Sp.	80%	30%	2.40	.030

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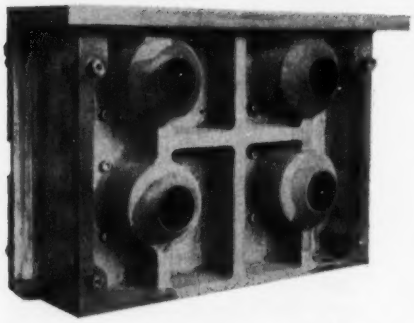
FACTORS TO CONSIDER IN



On continuously gas-fired machines backs of coreboxes should be contoured to equalize box temperature

Producing Shell Cores

Characteristics of the two basic types of resin binders and their relationship to types of shell cores and coremaking machines, mix formulations, corebox design, and casting defects are discussed

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● THE HEART of the shell process is the synthetic resin binder; without such a binder, we have no process. What we do with this binder determines, to a very large extent, what we produce in the form of an end product—a casting which is superior in its accuracy, surface finish, and physical properties at an economical cost or which is just plain scrap.

With this fact in mind, the following observations are intended to emphasize the importance of the relationship between the synthetic resin binder and each of the following: 1. Types of shell cores. 2. Mix formulation. 3. Corebox design. 4. Shell core machines. 5. Casting defects.

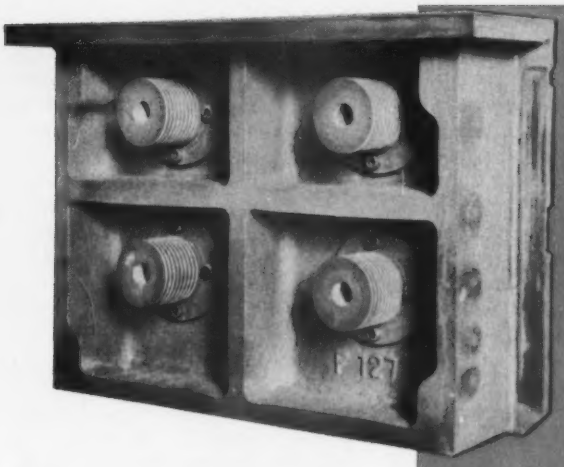
Types of Shell Cores—Until recently, most shell cores were made hollow by inverting the corebox and allowing the excess mix to drain out. This is still true of shell cores having cylindrical or boxlike sections in the weight range of a few ounces to 10 lb before draining. As the physical size of "boxlike" shell cores increased, however, it was found that such cores suffered from three major defects: 1. Metal breakthrough. 2. Physical distortion. 3. Thermal expansion.

The first defect can be overcome by forming the internal contour of the core on a mandrel so that wall thickness is rigidly controlled. Where it is not possible to straight-draw a mandrel because of the complexity of the core, it is standard practice to make the core in halves. When an open-faced box is used to form the external profile of the half core, the mandrel forms the internal profile with provision for ribbing to strengthen the core.

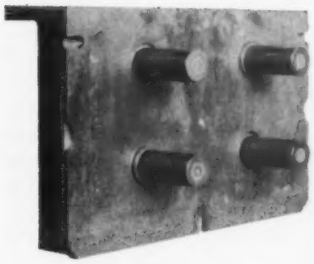
Around the periphery of the core halves, at the parting face, a groove is molded into one half and a mating tongue in the other. Cement is applied to the groove just prior to placing one half on the other under a light machine press. In this way a concealed joint is made which is stronger than the core itself.

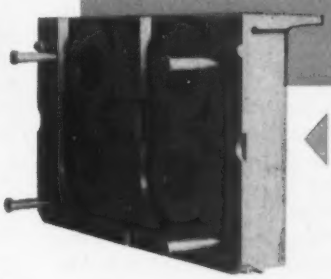
The second defect can be overcome by substituting contoured shell cores or by using solid shell cores. Economical production of solid shell cores is based on the use of a comparatively coarse shell sand and low resin content, then treating the core while it is still hot with a spray or dip.

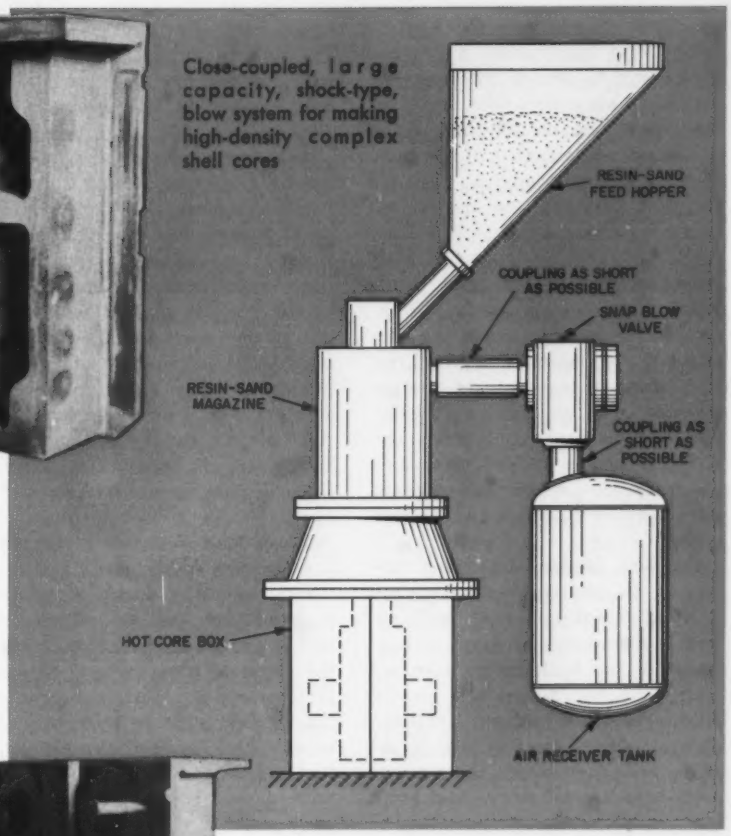
The third defect, thermal expansion, is the most difficult to overcome. A cushioning material must be added to a basic silica sand-resin mix, or zircon sand must be substituted. Because of the high initial cost of zircon sand some method of reclaiming should be employed when it is used. Some of the cushioning materials being used with various degrees of success are vinsol, pulverized cupola slag, pitch,



Finned heat collectors maintain temperatures of high projections on corebox for use on continuously gas-fired machine






Close-coupled, large capacity, shock-type, blow system for making high-density complex shell cores
RESIN-SAND FEED HOPPER
COUPLING AS SHORT AS POSSIBLE
SNAP BLOW VALVE
RESIN-SAND MAGAZINE
COUPLING AS SHORT AS POSSIBLE
HOT CORE BOX
AIR RECEIVER TANK

Springless ejection system. Note how the corner guide posts go through to parting face for retracting the pins as box closes

wood flour, expanded vermiculite and treated western bentonite. A low - melt - point, long-flow resin binder can be used when the expansion defect is caused by use of a fast-cure resin.

Other factors which enter into expansion problems are the geometric shape of the core, its location in the mold with respect to the ingates, and the as-cast surface finish required.

The Mix Formulation — Space will not permit a detailed discussion of the various methods used to coat shell sand with resin binder. Our remarks will be confined to the behavior of synthetic resins as influenced by time and temperature under practical operating conditions on the production line.

As received from the manufacturer, resin binders may be in lump, powder, or liquid form. Most resin manufacturers operate under closely controlled conditions—far closer than it is possible to achieve in the shell process. For this reason, when foundry difficulties arise because of lack of strength in the fully cured shell core, other possible causes should be investigated before attributing it to variations in the properties of the resin binder.

Broadly speaking, two types of synthetic resins are used as binders in the shell process—phenol-formaldehyde and urea-formaldehyde. The performance characteristics of these materials on a shell process production line are built in by the resin manufacturer. The main difference between them is the rate at which they burn out when used as a binder.

The ureas burn out at a much lower temperature than the phenolics. This fact may be used to control the collapsibility point of a shell core, particularly in nonferrous operations. It is a matter of blending the two types of resin. For instance, a blend made up by weight of two parts phenolic to one part urea may perform equally well in a shell core used for the casting of thin-sectioned gray iron or thick-sectioned aluminum.

Information on the compatibility of two resins for blending is freely available from technical representatives of resin manufacturers. So that these materials may be applied correctly on the shell core production line, however, a clear understanding of their behavior after having been coated on the sand grains is absolutely essential to the success of any shell process operation. It must be assumed here that whatever method is used to coat the sand—cold, warm, or hot process—the results are uniform resin distribution, no retained solvents, and a melt point that is uniform from

one batch of sand to the next.

The term "melt point" is in common usage to denote the temperature at which a resin film begins to flow from one coated sand grain to join up with another at the start of a shell core formation. For all practical purposes, its determination is relatively simple and is done with low-cost equipment. Melt points of resin-coated sand mixes fall in the range of 180 to 210° F. As the melt point increases, the flow rate and the flexural strength of the mix decreases, but the cure rate increases. In general, high-melt-point resin-coated sand mixes are used for simply shaped cores and low-melt-point resins for intricate cores with deep draws and narrow pockets.

Corebox Design—In many instances, oil-sand corebox equipment is being rigged and run "hot" on shell coremaking machines. Fair success is met with by such an arrangement, but where best results must be achieved in dimensional accuracy, surface finish, and minimum production cycles, the corebox must have been designed and built specifically for the shell process.

Shell coreboxes have three major functions: 1. To receive heat from the coremaking machine. 2. To transmit this heat evenly to the mix blown into the cavity. 3. To give accurate form to the finished core.

The heat exchange characteristics of a corebox must be correlated with the core machine's heating system to obtain the best results. Core machines may have electric or gas heating systems incorporated in either a tunnel or batch-type oven, or the heat may be applied continuously at the back of the corebox.

When a corebox is designed for use on a machine having tunnel or batch-type ovens, it will be subjected to intermittent heating cycles as it enters and leaves the oven. Here the objective is to store enough heat in the corebox so that while it is out of the oven for blowing and ejecting, its temperature will not fall below 400° F. To store heat, a corebox must have large mass; for this reason it usually is made solid. Because of its large mass, such a box will heat up and cool comparatively slowly. This heating and cooling cycle determines the production rate of the shell machine.

On the other hand, a corebox designed for use on a machine which applies heat continuously to the back of the corebox requires far less mass. With gas heating, the corebox must be contoured out on the back to minimize temperature gradients which could lead to uneven curing of the cores. The recommended minimum section thickness for such coreboxes is ¾ in. Thinner sections can be incorporated, but if they extend over large areas they have a tendency to distort eventually.

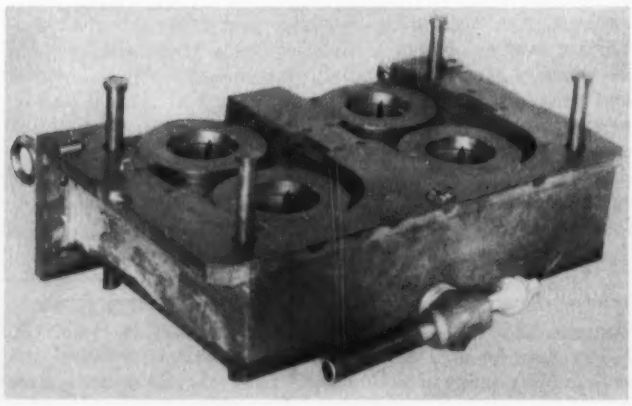
Materials for use in shell coreboxes should be close-grained, but not so tight that the silicone release agent will not penetrate the surface of the corebox cavity, thus causing sticky ejection. Beryllium copper is the best material for coreboxes when dimensional stability, excellent surface finish, high production, and long life are required. Stress-relieved alloy gray iron is almost as good and is used for the majority of high-production coreboxes. Heat treated aluminum alloys are most economical for short runs. When dimensional stability is important, aluminum never should be used.

Ejection or knockout pins must be fitted to shell coreboxes, except those designed for the production of cylindrical or shallow-draw cores. By the use of floating mountings and guideposts that come through to the parting face, ejection systems can be operated without return springs, which soften and create production difficulties. Such ejection systems have been standard practice in the diecasting industry for many years. A well conditioned box and minimum draft of 3 degrees presents little difficulty on ejection if vibration is applied to the box, even without the aid of ejector pins.

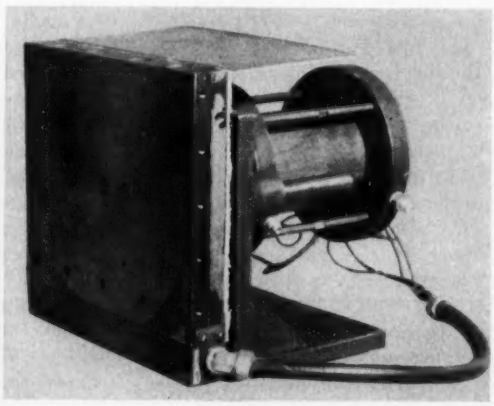
Venting of shell coreboxes presents an entirely different problem from that encountered with processes employing mixes of low flowability. In the shell process, almost the same instant the resin sand mix contacts the hot face of the corebox cavity, the resin binder goes through its "gel" phase. In this semi-cured state the mix is impermeable; not until the later stages of final cure does it begin to exhibit the high permeability generally associated with shell cores.

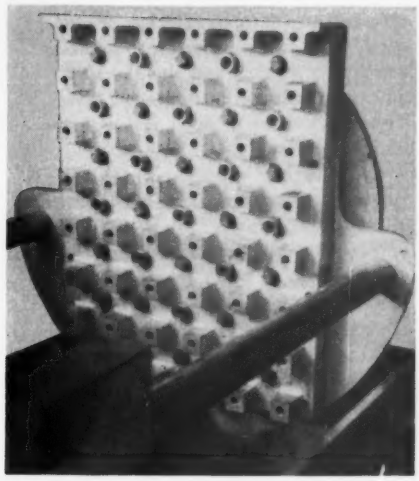
Any method adopted for the venting of shell coreboxes should take

One type of venturi unit fitted to coreboxes for generating negative pressure during venting



An electrical heating platen is shown mounted on a horizontal shell machine clamp





Blast-tip gas heating platen used on job-shop shell machines

into account the extremely short duration of the venting phase. The most common venting practice is to cut grooves from the core cavity at the parting face either out to the edge of the box or to a vent hole leading to the back of the box. Dimensions of the venting grooves may vary from deep scratches made with a scribing tool to machined openings $\frac{5}{8}$ in. wide by 0.010 in. deep. For those coreboxes having deep pockets and narrow passages to be filled by reversed flow of the mix with respect to the direction of entry, negative pressure venting generally is employed.

One method of generating negative pressure on the box just prior to the blow consists of a venturi airjector fastened to either the bottom or back of the corebox and a passage leading to the cavity which is plugged with a stainless steel screen vent. Mesh sizes are No. 50 for sands up to 70 AFS fineness. No. 80 for sands up to 140 AFS fineness, and No. 150 for sands up to 180 AFS fineness. By piping compressed air from the core machine's clamp-up cylinder supply to the venturi airjector, a negative pressure of 3 psi, or 6 in. Hg, is drawn on the corebox cavity just prior to the mix being blown. When high density, intricate cores are required, negative pressure venting is almost a necessity.

Shell Core Machines—From a production standpoint, the main factor governing the speed of machine operation is the time required to cure the resin binder properly. Proper curing of a shell core is a time-temperature function. Time is a simple matter to control, but corebox temperature is subject to a number of interrelated factors. As a result, the degree of cure can vary, not only from core to core, but in different areas of the same core. Without constant, uniform cure, maximum strength for minimum resin content is not achieved. Resin binder is wasted and casting quality, as regards dimensional stability and surface finish, is lowered.

Shell core machines are available with either gas or electric heating systems. Operating temperatures for the shell process impose severe service loads on electrical heating elements. These units generally are designed on the basis of wattage dissipated per square inch of element surface area, and the present limit appears to be 32 watts per square inch or approximately 100 Btu per square inch. To work at higher watt densities shortens their life.

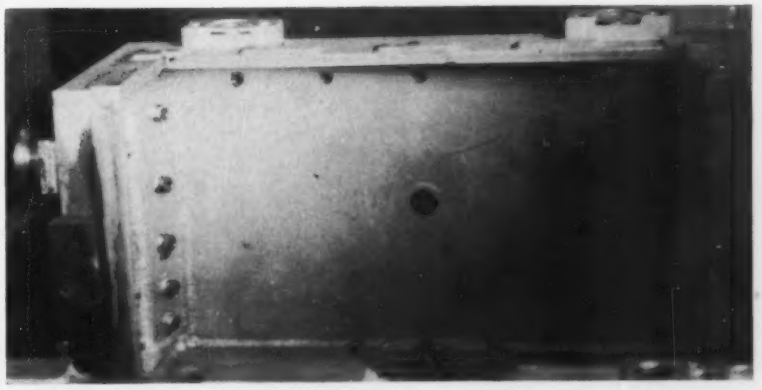
To obtain good heat conduction from the face of an electric heating platen on a shell machine, it is essential to machine the back of the coreboxes flat. Total heat input to such a box therefore cannot exceed the total area of the back of the box in square inches, times 100 Btu. On the other hand, the cavities cut into the front of the coreboxes increase the surface area of the front so that there is more area of heat dissipation than area of input. This being the case, electrically heated machines are limited in their speed of production because it is possible to cycle the machine at such a speed that the heat extracted by the curing of cores is greater than the heat input.

Gas-heated shell machines have a much greater speed of heat transfer. The limiting factor is the temperature reached at the back of the contoured box; it is usual to work them as high as 700° F with an on-off temperature control system. By rearranging burner tips, a wide range of temperature gradients can be applied to various types of coreboxes. Such flexibility is essential in any type of job-shop operation.

Flexibility of operation also is limited by the type of blow system used to fill the corebox with mix. All present systems—dump-blow, top-blow, side-blow, and bottom-blow—will produce simple cylindrical cores of uniform density. But as the size increases and the shape becomes more complex, the real value of a close-coupled air receiver, blow valve, magazine system becomes more apparent, especially to solve the problem of making that "impossible" core.

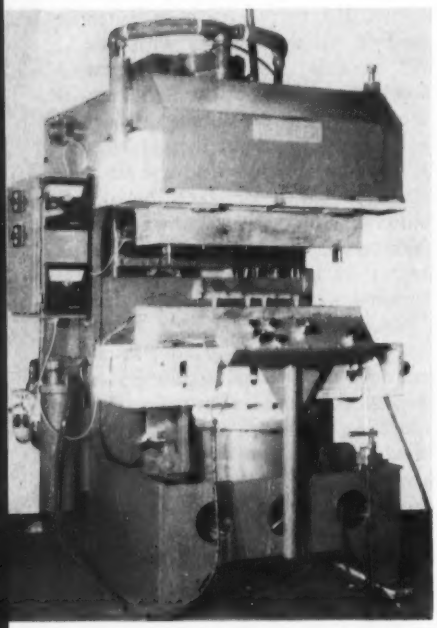
For the purpose of illustration, consider the thermal conditions experienced by the mix on a shell machine. The instant a grain of sand comes to rest at the face of a corebox cavity, its resin film is subjected to a temperature difference of 370° F, assuming the sand was at room temperature 70° F and the box at 450° F. Within two seconds, the heat has melted the resin and transformed it into a gel-like

Illustration shows a high efficiency, wrap-around, blast-tip gas heating half-oven which is used on high speed shell machines



substance, fixing the sand grain in place and reducing the permeability to zero.

As the heat continues to travel through the mix, the resin sets up solid and shrinks, leaving links of resin and voids between the sand grains to restore the excellent permeability generally associated with shell cores. Therefore, if density is a prime consideration in a core of complex shape, the box must be run on a machine capable of filling the box completely within 2 seconds. Failure to do so will lead to subsurface voids, and the cores will break down during pouring, especially in the case of solid or contoured shell core applications.



This is one type of shell machine used for the production of solid and contoured cores

Casting Defects—Shell cores set in conventional sand molds do not affect the feeding range of the product metal, but they do affect the solidification time of several common foundry alloys. Thermal studies have shown that where the metal section is ½ in., solidification time is unchanged for all practical purposes. With sections of 1 to 1½ in., however, solidification time may be reduced by as much as 20 per cent, especially where the shell core has large hollow sections.

As-cast surface finish produced by shell cores is a function of pouring temperature, core density, sand fineness, gas evolution, gating, and molten metal reaction.

With most alloys, the lowest practical pouring temperature results in the smoothest casting surface. Core density should be as high as it is possible to achieve with the shell core blowers having close-coupled blow systems. Fineness of sand for use with ferrous metals should be in the range of 45 to 65 AFS fineness for small, hollow-drained cores. In nonferrous work, sand fineness should run 80 to 100 for solid cores, 100 to 120 for contoured cores, and up to 120 to 150 for small, hollow-drained cores.

Gas evolution is a problem in nonferrous operations. For solid cores, however, if a minimum resin content is used and additional venting provided by rodding the semicured core in the box, the problem can be solved in many cases. An insufficient number of ingates can lead to thermal cracking of the shell core, with resultant breakthrough of the molten metal. Molten metal reaction is confined to the Type B carbon steels and magnesium alloys.

Considerable experimental work has been done on the elimination of surface pitting of Type B carbon steels. The best results reported to date have resulted from the addition of 5 per cent, by weight of sand, of a fine-mesh calcium carbonate which is added in dry powder form to a resin-coated zircon sand mix.

When such a combination is used in a shell core blower, the $CaCO_3$ migrates or segregates to the cavity face of the corebox. When the molten metal is poured against the core, the $CaCO_3$ acts as a powerful deoxidizer and tends to minimize the pit formation.

Shell cores for use in magnesium casting operations require an inhibitor in the resin-sand mix. One of the most successful is ammonia-borofluoride. Added as a dry powder addition of 0.5 per cent by weight of resin, it effectively inhibits the metal-core reaction.

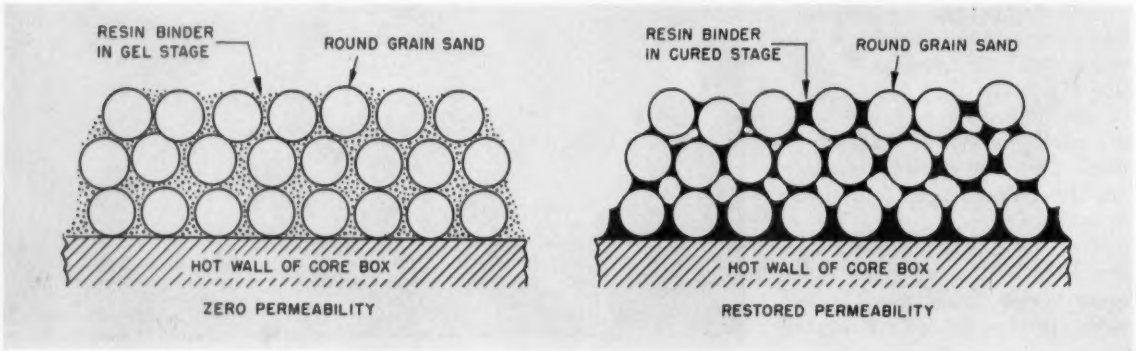
Where cored holes and cavities have to be held to close dimensional tolerances, a low-melt-point resin binder should be used. Optimum dimensional stability is achieved when the curing temperature of the shell cores is lowered to 350° F and the cure time extended to approximately 3 minutes.

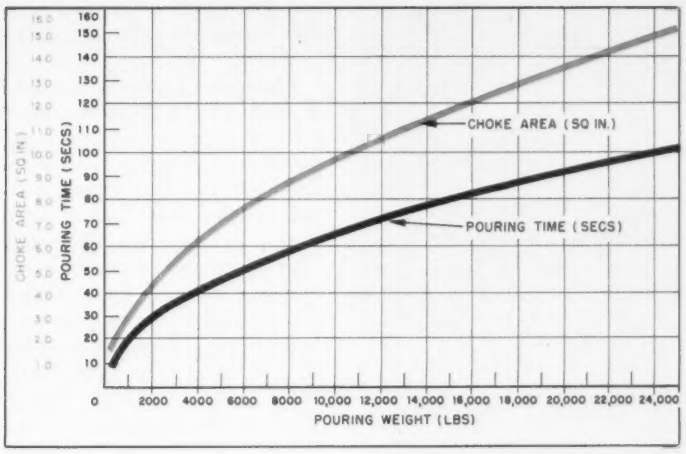
Editor's Note: This paper was presented at the 12th annual Metals Casting Conference held at Purdue University, Oct. 29-30.

● For an extra copy of this article, until supply is exhausted, use card on Page 53

Resin-sand configuration one second after the blow, showing zero permeability during gel stage

Resin-sand configuration when shell core temperature reached 230° F, showing restored permeability





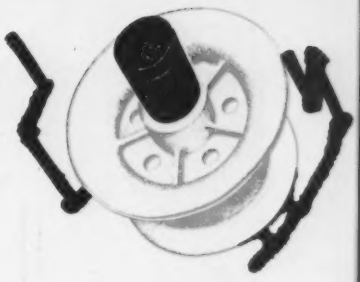


Fig. 1—Graph shows pouring time and choke area as related to pouring weight

GATING of Ductile Iron Castings

This article, fifth in our gating and risering series, discusses the gating to produce quality ductile iron castings, with some explanation of the fundamental characteristics of ductile iron

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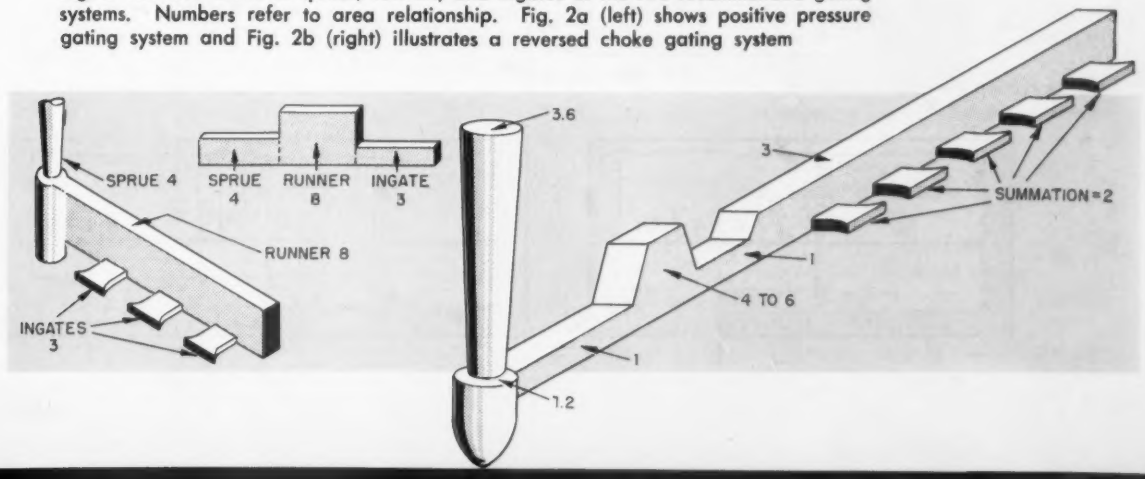
● WHAT is ductile iron? Many foundrymen believe that when sufficient magnesium is added, only the graphite structure is changed, and they proceed to make castings using techniques that are mostly associated with other ferrous metals. As a result, many problems develop. With the change in graphite structure, a completely new ferrous metal evolves with its own "personality and temperament." It is not like malleable iron, gray iron, or steel; however, it may have similarities with all of them.

Although the primary interest in this discussion is in producing quality castings from a gating and risering approach, it is necessary that some of the fundamental characteristics of ductile iron be treated briefly so that a better understanding of these characteristics is obtained.

Wide variations in metal composition, processing treatment, pouring temperature, molding material, and

Fig. 2—Relative areas of sprues, runners, and ingates of the two recommended gating systems. Numbers refer to area relationship. Fig. 2a (left) shows positive pressure gating system and Fig. 2b (right) illustrates a reversed choke gating system



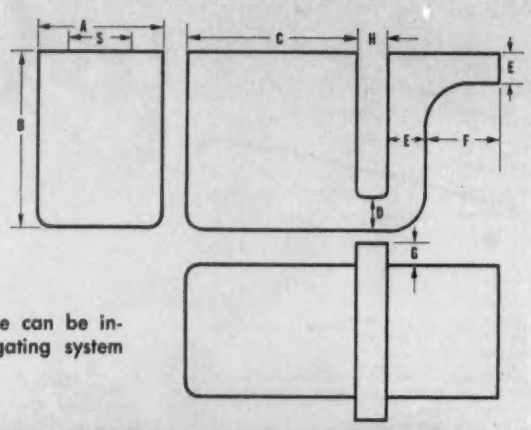


Fig. 3—The dam gate can be incorporated in any gating system

SPRUE DIAM	SPRUE AREA	APPX DELIVERY LBS./SEC.	A (IN.)	B (IN.)	C (IN.)	D (IN.)	E (IN.)	F (IN.)	G (IN.)	H (IN.)
1 1/8"	1.00	16	20	3 1/2	5.	3/8	1/2	1 1/2	1/2	1/2
1 1/4	1.23	20	2 1/2	4 1/2	6.	3/8	5/8	1 7/8	1/2	1/2
1 3/8	1.48	24	2 3/4	4 1/2	6 1/2	3/8	11/16	2 1/8	3/4	3/4
1 1/2	1.77	28	3.0	4 1/2	7.	7/16	3/4	2 1/4	3/4	3/4
1 3/4	2.40	38	3 1/2	5 1/2	8.	1/2	13/16	2 3/8	1.	3/4
2.0	3.14	48	4	5 3/4	9	9/16	1.	3.	1.	3/4

method of gating cause variations in structure, dimensions, and quality of the castings produced, just as in gray iron. Control in all phases of the operation is necessary in order to produce quality castings.

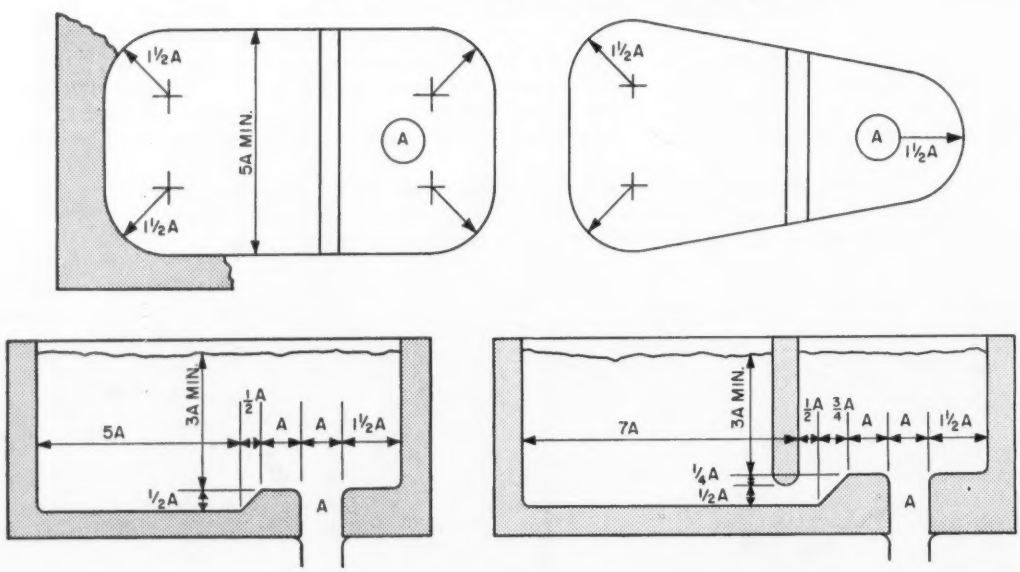
Oxidizing Iron—When sufficient magnesium is retained in iron to produce spheroidal graphite, the result is an iron which oxidizes easily. Excessive retained magnesium greatly increases the oxidation products, which makes it very difficult, if not impossible, to effectively gate large castings to eliminate potential dross defects. Control over metal refinement in melting, the metal temperature, the weight of metal treated and the weight of magnesium alloy used effectively pays off in the final product.

Chemistry Control—Ductile iron is essentially a hypereutectic iron. General engineering castings are produced having a carbon range from 3.40 to 3.80 per cent with silicon ranging from 2.20 to 2.80 per cent. Solidification characteristics change with this wide range of carbon and silicon. The solidification characteristics between hypo and hypereutectic irons are well known in gray iron. The same characteristics apply to ductile iron. The ideal carbon range is 3.50 to 3.70 per cent with the carbon equivalent ranging from 4.3 to 4.5 per cent. When control is exercised in this phase of the operation, some of the variations that were previously experienced are eliminated.

Pattern Shrinkage—Castings requiring specified structures and close dimensional tolerances necessitate close process control to produce consistent uniformity. Any matrix structure may be produced by the processing treatment. The type of magnesium alloy and the amount of ferrosilicon inoculant used determine the structure and casting dimension, assuming that the chemistry of the iron is uniform.

With a substantially pearlitic matrix, the pattern shrinkage is 0.15 in. per ft; on annealing to ferrite,

Fig. 4—Dimensions for rectangular or pear-shaped dry sand basin. The figure at the lower right gives dimensions using skim bar



it grows about 0.05 in. per ft. When the matrix is ferritic there is no pattern shrinkage. Should the casting be produced white, or with a carbidic matrix, the pattern shrinkage will be 0.20 in. per ft. On full annealing, the iron will grow 0.30 in. per ft so that castings made in this manner will be larger than the pattern.

Pouring Temperature—The pouring temperature of ductile iron is very important since it is an easily oxidized metal. When the pouring temperature falls below 2550° F, the oxidation product increases. A temperature of 2600° F and above is preferred because the oxide still is liquid and does not present as great a hazard as it does in the solid state. The iron also is more fluid and better separation can be effected. Because of the composition, the fluidity of ductile iron is very good. With a CE of 4.5, the mushy stage does not appear until about 2300° F. This often is a deterrent to producing sound, clean castings, and foundrymen often tend to pour molds as long as the metal will flow.

Surface Tension — When sufficient magnesium is retained in iron, the surface tension is increased. K. Grutter and B. Marincek[1] published a paper on "The Influence of Surface Tension on the Formation of Graphite in Cast Iron." In this paper, surface tension values of 1300-1400 dynes per cm are given for ductile iron and 800-900 dynes per cm for gray iron. Although these figures have not been rechecked, they do verify observations in the foundry.

Because of the solidification characteristics, which will be described later in the risering section, and the high surface tension, ductile iron could well be described as being like water in a rubber balloon. This is a great advantage if understood, but it can be very troublesome if not compensated for in mold preparation. With the higher surface tension, burn-in is not experienced as in other ferrous metals and, as a result, foundrymen do not ram green sand molds as hard as they should. A hard rammed, low deformation and high hot strength sand is necessary to produce castings of consistent dimensions.

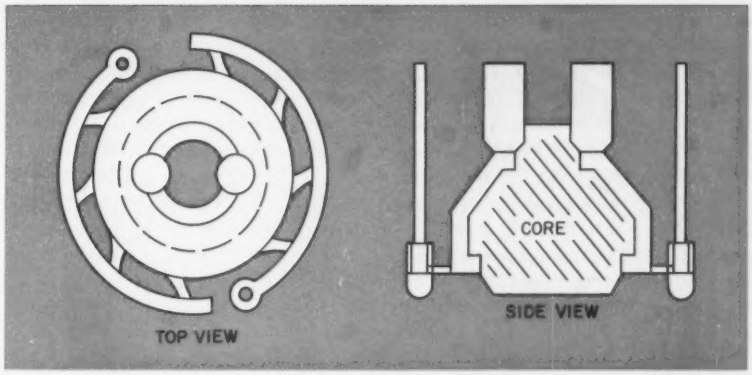


Fig. 6—Example of bottom gating with gates properly spaced and slightly tangent to the casting, permitting circular motion of metal in the casting and eliminating direct impingement on the center core

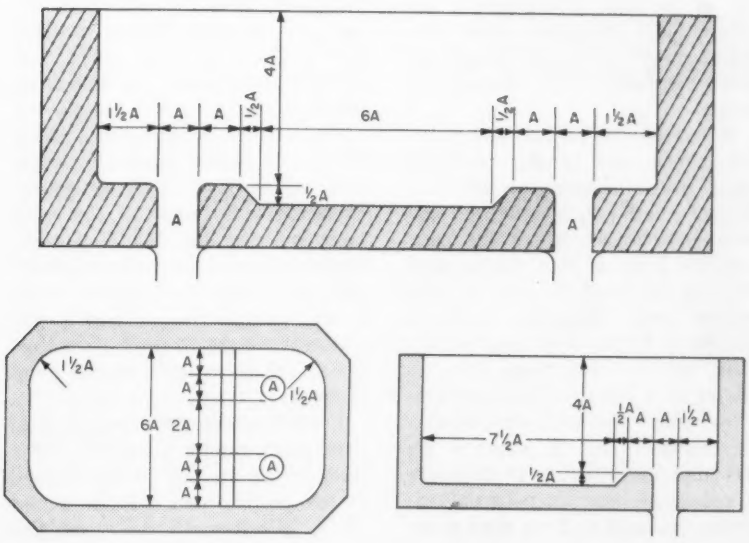
Metal Handling — In gating a mold for ductile iron, the most important fact to remember is that the metal is easily oxidized and must be handled as any other oxidizing metal. Foundrymen skilled in the art of producing magnesium, aluminum, or certain nonferrous castings are well aware of this problem. In addition, cold alloy is added to the iron during the treating process that generates considerable sulfides and silicates which must be skimmed from the ladles and trapped out by an effective gating system.

The Gating System—The gating of ductile iron warrants special attention because of its importance in helping to produce clean castings. Before a pattern is placed in the mold it should be studied carefully. Attempt to analyze the paths of metal flow in filling the mold so that a gating system may be designed which will fulfill these functions:

1. Retain the slag and dirt in the gating system ahead of the mold cavity.
2. Introduce the metal into the mold with as little turbulence as possible.
3. Control the rate of entry of metal into the mold cavity.
4. Establish the best possible metal distribution.

The first step in designing a gat-

Fig. 5—Diagrams give dimensions of a pouring basin using two outlets



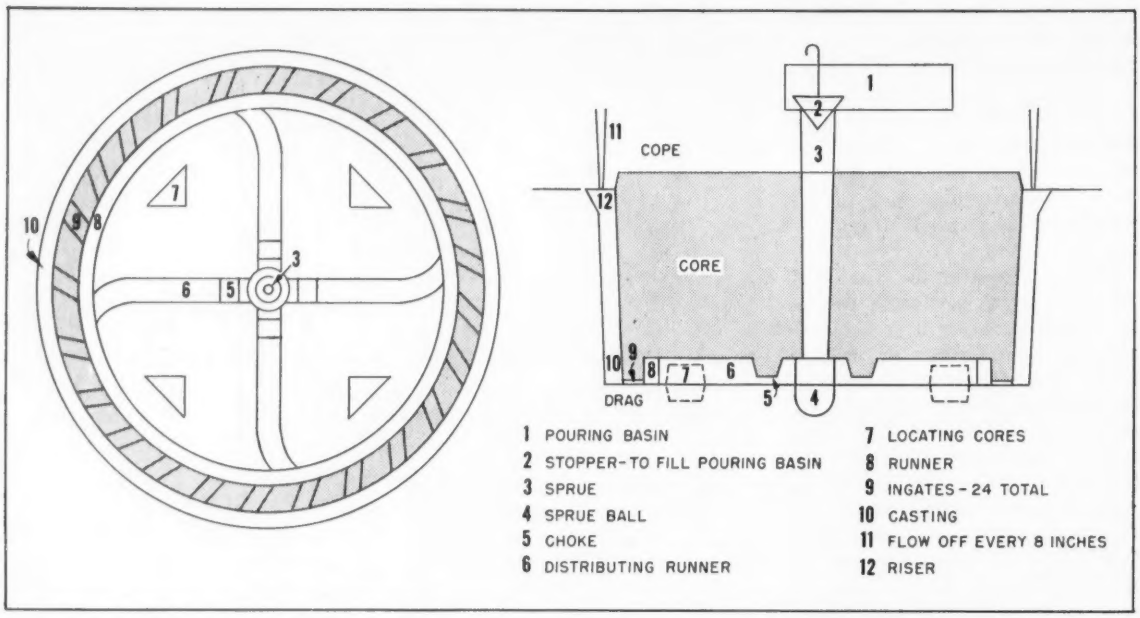


Fig. 7—Gating for bearing support ring. Mold pours in 11-13 sec at 2650-2700° F. Center core must be extremely well ventilated. Approximate pouring weight, 400 lb

ing system is to determine the proper points of metal entry, keeping in mind means of minimizing turbulence in the mold cavity and proper metal distribution. It is important to consider always using a gating system that introduces the metal at the bottom of the mold cavity with sufficient ingates to keep the length of metal flow from each ingate to a minimum.

The next step is to determine the speed with which the mold should be poured and then to calculate the required ingate area, which depends on the pouring weight and the pouring time.

The third step is to determine the remainder of the gating system, i.e., the sprue and the runner by means of definite ratios that have been established between the areas of sprue, runner, and ingate to produce clean castings.

Pouring Speeds—Most foundrymen on the "firing line" have neither the time nor the inclination to use the excellent formulas developed to determine pouring speed, effective sprue height, and choke area. A simple chart has been prepared similar to the one developed by Dietert several years ago. Effective sprue height is averaged out for all weights since the curves are based only on the preferred method of metal entering the bottom of the mold cavity.

Fig. 1 shows two curves. The pouring time related to pouring weight curve is derived from the formula $\text{Pouring Time} = 0.65 \sqrt{\text{Pouring Weight}}$ and has been derived as the best average time to pour ductile iron. In pouring ductile iron, it is advisable to set a maximum pouring time of two minutes for castings requiring a pouring weight above 25,000 lb regardless of the size of the casting involved. For intricately cored castings, shorter pouring times on many occasions are an absolute necessity.

It has been observed that pouring times and gating methods which are satisfactory for gray iron are not suitable for ductile iron and more particularly where the castings are large, of thin section, and are heavily cored to give a large surface area. Fonderia Caster, a successful ductile iron producer in Italy, uses pouring times that are 50 per cent less than the ones suggested here—and with very satisfactory results. This all points to the fact that fast pouring is necessary to reduce the time for potential oxidation products to form during the filling of the mold cavity.

The curve relating choke area to pouring weight is correlated with pouring time so that it may be used as a starting point for designing a properly dimensioned gating system. Many variables enter into the pouring of a casting, such as metal temperature, height of pouring head, effective sprue height, use of dry or green molding sand, and mold pressure—all of which will affect the pouring time. The net effect of these variables may necessitate some adjustment in the choke area to maintain desired pouring time. The choke area curve will, however, be a good base point from which to begin.

As mentioned previously, it is likely that certain types of castings will require faster pouring speeds. If the pouring weight of the mold is known and the desired pouring time determined, the necessary choke area may easily be computed, using a unit rate of 16 lb of iron per square inch per second. The following is an example of this type of computation:

Pouring weight 6000 pounds. Desired pouring time 30 seconds. 6000 lb ÷ 30 sec. = 200 lb/sec, the required pouring rate. 200 lb/sec ÷ 16 lb/sq in./sec = 12.5 sq in., the

required choke area.

Types of Gating Systems—The pattern has been studied to determine the best points of metal entry, the pouring time and choke area have been ascertained, and all that remains is to select the best type gating system. Two systems can be used for gating castings in ductile iron. Both of them have been proof-tested and are used with success in producing clean castings. They are illustrated in Fig. 2 and are designated as: a. Positive pressure system in which the choke occurs at the junction of the runner bar and ingate. b. Tranquil flow or reversed choke system in which the choke occurs immediately after the sprue.

The design of the positive pressure system has as its objective the reduction of metal velocity in the runner system to allow slag or inclusions to rise and be trapped in the runner. It has been determined that a sprue: runner: ingate cross-sectional area ratio of 4:8:3, as shown in Fig. 2a performs this function. By using this ratio, the sprue and runner size easily can be calculated, knowing the required choke area. In dimensioning the runner bar for a given area, it is desirable that the height of the bar be in the order of twice the width so that inclusions may be separated from the metal more effectively.

Various gating systems have been tried that incorporate the larger runner system to reduce velocity and improve uniformity of flow. Systems devised by Johnson, Baker and Pellini,[2] Eastwood[3] and Glick, Jackson, and Ruddle[4] did not prove satisfactory since these systems were basically a reverse choke system. It seems that the best results are obtained when there is a positive choke on the ingates and when the ingates are taken from the bottom of the runner section.

In designing the reversed choke system, the choke is placed adjacent to the base of the sprue. The area ratios established for this system are indicated in Fig. 2b. A positive pressure kept on the choke area minimizes aspiration and oxidation. Any turbulence resulting from the metal being forced into the runner bar has ample space to diminish before the metal flows through the ingates into the mold cavity. This system has been designed specifically for plate type

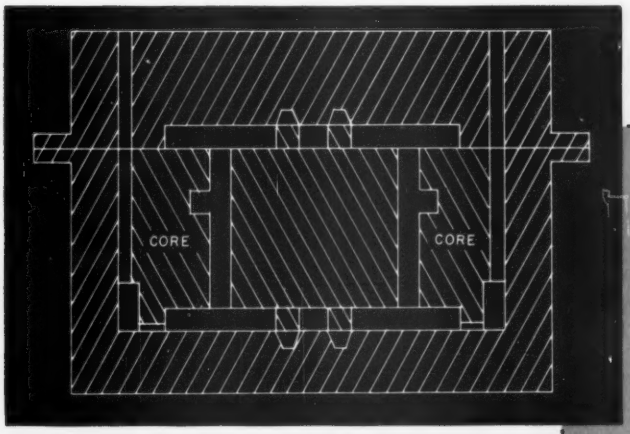
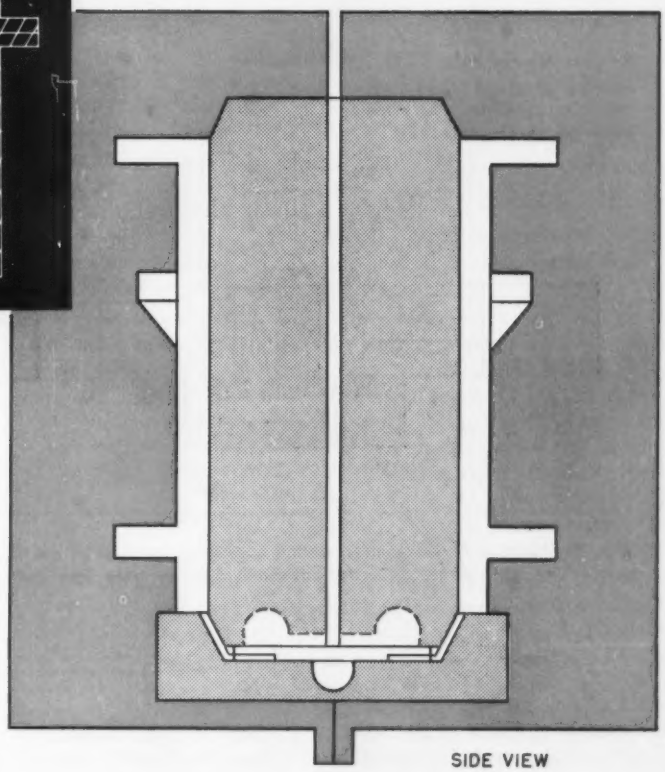


Fig. 8—When side cores are required, an ideal situation is created to utilize bottom gating through placement of the gating system in the core



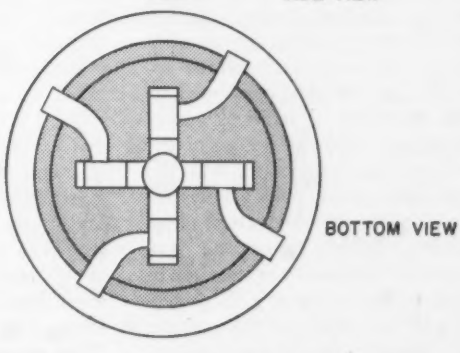


Fig. 9—Bottom gating through the core, using a horn gate principle

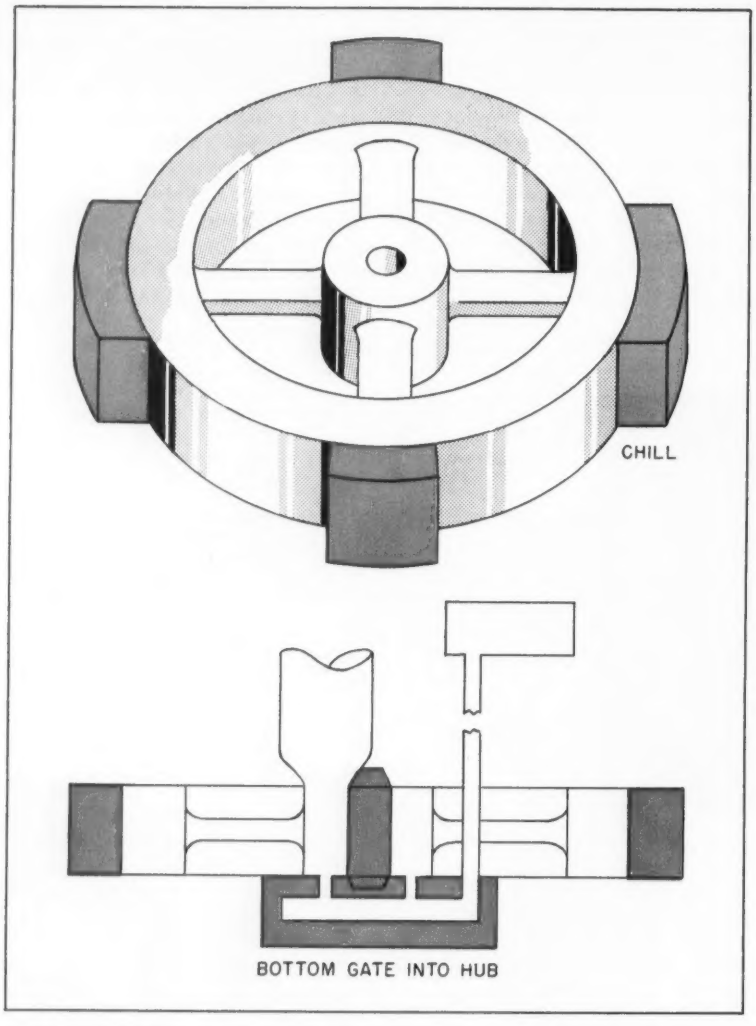


Fig. 10—Method of using chills at the spoke-rim junction of ductile iron gears has advantages. Illustration shows bottom gate into hub

castings and castings that are basically all in the cope of the mold.

One of the most important features in a gating system, particularly for an oxidizing metal, is a design to eliminate or minimize aspiration. It has been confirmed on molds requiring a relatively short time to pour that the design of the sprue, runner connection, and the taper of the sprue play a very important part in producing clean castings. When the sprue and runner connection is twice the diameter of the sprue at the connection and the depth of the connection is equal to its diameter, aspiration is reduced to the barest minimum.

To illustrate, a 1¼-in. tapered sprue is used requiring a 2½-in.-diam connection that is 2½ in. deep. This will reduce aspiration of this point to approximately 2 seconds and will have a pronounced effect on squeezer molds that may require 5 to 6 seconds to pour.

To eliminate the Venturi effect of metal flow in the sprue, a taper is required so that the metal will lay on the mold wall the complete length of the sprue. This arrangement requires an increase in area from bottom to top. A ratio of three (3) gives the best results. This means that a sprue having 1.20 sq in. area at the base (1¼-in. diam) would have 3.6 sq in. (2⅛-in. diam) area at the top.

The familiar dam gate, Fig. 3, is a useful and effective system for introducing clean metal to the mold cavity. It can be incorporated into any gating system although its most popular use is with risers for those castings usually requiring only a single riser. When used this way, the discharge end of the dam gate is reversed from a horizontal plane to a vertical plane to better introduce the metal to the bottom of the riser and to create a swirl in the riser. The best location for the gate is perpendicular to the riser-casting connection so that the greater velocity of metal flow across the neck will keep any inclusions from flowing into the mold cavity.

Pouring Basins—To complete the gating system, a pouring basin is necessary. It is one of the important parts in a gating system and, in many cases, the most completely ignored. If not properly prepared and dimensioned, erratic results are obtained. Properly dimensioned pouring basins are shown in Fig. 4 and 5. Although dry sand is preferred, patterns may be made so that green sand pouring basins can be rammed on the mold.

Even on squeezer molds it is advisable to have an offset pouring basin mounted on the squeeze board in order to have a pouring basin that the pourer can keep full at all times. The best designed gating system is ineffective if not properly filled and kept full for the full length of pour.

Incorporating the Gating System—After the gating system has been designed, the question arises as to how to incorporate it into the mold. The cutting of gating systems by hand is undesirable and usually results in disturbed sand, inaccuracy of dimensions, and wide variations from mold to mold. Whenever possible, the gating system should be made a part of the pattern.

The use of loose-piece ingates, ram-up cores, or tile for ingates to produce a closely dimensioned choke in relation to the sprue can be used on loose piece work to gain control of the gating system. By taking this step, many of the variables that exist between similar castings are eliminated and results are not as dependent upon the molder.

Since bottom gating is recommended for ductile iron to reduce

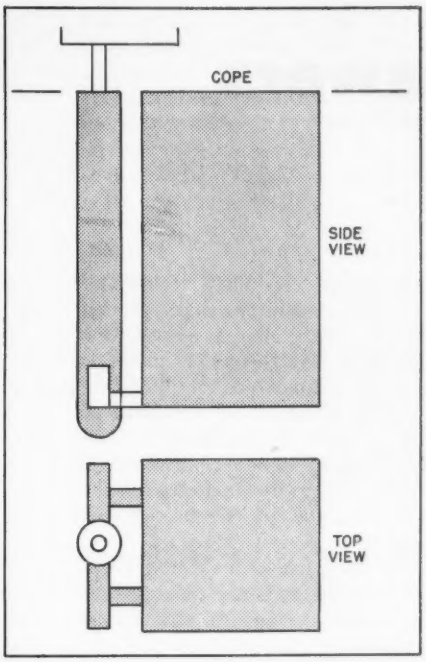


Fig. 11—Variation of tranquil flow system. Ram-up gate cores can be employed if more than one ingate is desired

turbulence and oxidation in the mold cavity, it may be helpful to illustrate various methods by which it is accomplished. One of the easiest to rig is illustrated in Fig. 6 where all of the casting is produced in the cope of the mold. For this type of casting, the gating can very easily be mounted on the pattern board. On many occasions, foundries have made new patterns in such a way that this arrangement may be accomplished.

Fig. 7 shows the gating arrangement for a highly stressed bearing support ring which must pass 100 per cent x-ray inspection. Most of the gating system for this casting is placed in the corebox.

The casting configuration on many occasions will require side cores. This presents an ideal opportunity to incorporate a bottom gating system in the cores as illustrated in Fig. 8.

Horn gates work very well in locations that are difficult to reach, provided a reversed choke is used. One means of using the horn gate principle in conjunction with bottom gating is illustrated in Fig. 9. The bottom part of the gate can be made in the mold by using loose pieces on the pattern, or it can be made from cores. This mold is rammed and cored up in the horizontal position and then set vertical for pouring.

The same principle is illustrated in Fig. 10. In this instance, a ram-up core is used to form the gating system at the bottom of the mold cavity. This method of producing spoke type gears in dry sand molds by using chills at the spoke-rim junction is successful. The chills have twice the volume as the volume they cover in order to prevent shrinkage at the junction.

The method of gating illustrated in Fig. 11 is a variation of the tranquil flow system. Here the complete choke is in the pouring basin and cope sprue (ratio of 1). The drag sprue (ratio of 6) is very large and fills to approximately the same level as in the casting. Practically all turbulence in this system is confined to the drag sprue and a quiet flow of metal goes through the ingates (ratio of 1.5).

On molds that have deep cavities, it is desirable to introduce hot metal at the metal line as the mold fills. Fig. 12 is a design of a gating system that will perform this function. Since the effective sprue height is controlled as the metal rises to a higher gate, that gate will start to function. The gating

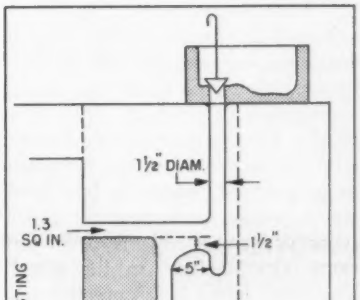


Fig. 12—Illustration of step gating, used when it is desirable to introduce hot metal at the metal line while mold fills

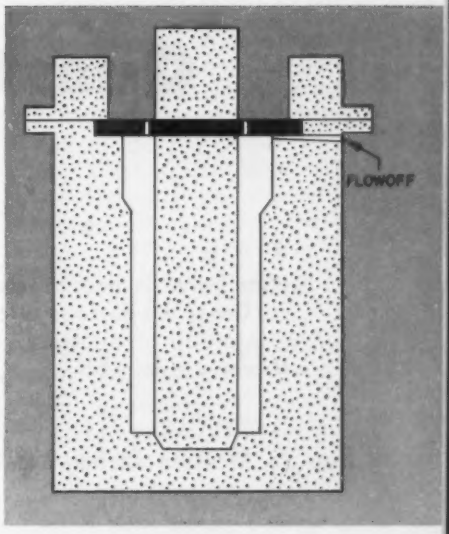


Fig. 13—Top gating method. It is beneficial to have several flowoffs to flush slag from the mold and to drain pouring basin

system is made as a split core, then pasted together and inserted in the mold.

Top gating or pencil gates work very well for making straight-walled cylindrical castings of ductile iron. With this method, sufficient turbulence is created to force the nonmetallics which are formed up into the riser, provisions for which must be made just below the pencil gates. A top gating method is shown in Fig. 13.

To insure sufficient turbulence on all of the metal surface so that no inclusions will stick to the mold wall, the pencil gates should be placed so that they are never more than three times the section (of the casting) apart. This method of gating has produced excellent castings ranging from a small diesel engine liner 5/8-in. section, 5-in. diameter, 13 in. long to paper press rolls of 4-in. section, 44-in. diameter, 288 in. long.

Risering of ductile iron castings will be discussed next month.

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2. Johnson, Baker and Pellini, *Transactions*, AFS, 1950.
3. L. L. Eastwood, *Transactions*, AFS, 1951.
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Questions and Answers

Dollar value is best procedure for figuring casting loss . . . Gassy nonferrous alloys can be treated effectively by injection of nitrogen . . . Hole in casting is due to extremely thin wall . . . Coke moisture has little effect

How To Measure Casting Loss

Can you supply us with any information on what would be considered a fair average defective casting loss in a gray iron foundry? We would like to have that for comparison with our figures.

Foundrymen, like other manufacturers, for obvious reasons are reluctant to divulge information on losses due to defective castings, and estimates run from 3 to 20 per cent. Furthermore, customer specifications on casting quality vary widely so that a casting in one case may be acceptable and defective in another.

Even in one foundry the requirements may differ between types of castings so that the term "average defective loss" is hard to define.

Casting losses may be indicated by per cent in weight, per cent in number, or by dollar value. In our opinion the last basis is soundest and most revealing since a casting discarded at the shakeout involves less cost than one going through several cleaning operations and inspections before being discarded.

With those considerations in mind, the following figures gathered from various sources some years ago are presented. A foundry producing 70,000 tons a year of automobile engine castings reported 4½ per cent of the sales value in foundry defectives and 1½ per cent in customer returns.

Another producing 43,000 tons of castings weighing from a few ounces up to 90 tons for agricultural tractors, implements, heavy machinery, electrical equipment, etc., indicated 5.8 per cent total defective castings.

A large electrical manufacturer showed a total of defective castings as 7.2 per cent of the value with 3.8 per cent after final inspection and 3.4 per cent after machining.

An automotive foundry indicated a 5.4 per cent defective casting loss from all sources on 156,321 castings, with 0.8 per cent before cleaning, 3.3 per cent after final inspection, and 1.3 per cent machine shop rejects.

Degassing Nonferrous Alloys

We have been experimenting with the use of nitrogen to degas and refine our nonferrous metals—brass, bronze, and some aluminum. So far it has not been too successful since our castings show gas porosity after flushing with nitrogen. We are melting in a No. 125 crucible in gas-fired furnace. Nitrogen pressure is 5 psi through a ½-in. pipe to a 2-in. graphite fluxing tube. We will appreciate any comments or information which will be of help.

Your lack of success with nitrogen degassing suggests several possibilities which might affect the results—or rather the lack of satisfactory results. One is the type of nitrogen used. It should be nitrogen known as oil-pumped, which is free from water vapor and oxygen. Some types of commercial nitrogen can cause increased gas in the metal. The other factor is the practice employed.

In degassing with nitrogen or chlorine it is essential that the fluxing tube be preheated just prior to use to insure that it is moisture-free; the tube has a tendency to pick up moisture from the atmosphere on standing at room temperature. Another factor is the temperature at which the degassing is conducted. In the case of aluminum alloys, degassing should begin when the temperature is 50° F below the pouring temperature, and treatment of copper-base alloys is started when the temperature is 50° F above the pouring temperature.

Other factors to be considered are the amount of the fluxing or degasifying agent to be used and, in the case of gaseous agents, the rate of admission to obtain efficient results.

In the degassing of aluminum alloys with nitrogen, there seems to be a difference of opinion on the amount of the addition and the rate of admission, but perhaps less than appears at first glance. Suggested amount of nitrogen ranges from 1 to 3 cu ft per 100 lb of molten metal. The rate of admission ranges from that just sufficient to cause a gently rolling action on the surface to as rapidly as possible without resulting in excessive splashing.

The slower rate of admission is associated with the lower amount of gas, and the rapid rate with the higher volume of gas. Action of nitrogen in degassing is mechanical, and apparently with high rates of admission, more gas is required to obtain the desired results than when the admission is slower.

Rate of admission also is related to the quantity of metal to be treated. In the case of a 150-lb lot it is indicated that a rate of 20 cu ft per hour at 2 psi, and 1 to 1.25 cu ft per 100 lb of metal, will provide a gentle rolling action. With larger amounts the rate of admission may be increased. In any case it is recommended that the metal be allowed to "rest" for 15 to 20 minutes after treatment. During that period the metal is gradually brought up to the pouring temperature.

With copper-base alloys the suggested minimum amount of nitrogen is about 0.4 cu ft per 100 lb of alloy except in the case of brasses containing 10 per cent or over of zinc, when it is reduced to 0.1 cu ft. Reason for the lower quantity with

the brasses, is that zinc itself, through volatilization, functions as a degasifier, and excessive injection of nitrogen or other gas will cause greater evolution and loss of zinc. Treatment of copper-base alloys is similar to that for aluminum alloys.

In treatment of both types of alloys, the injection or fluxing tube should be pushed close to the bottom of the molten metal bath, and preferably moved about slowly so that there is an intimate contact between metal and gas. Attention also is directed to the possibility of thoroughly degassed metal resulting in internal shrinkage problems unless adequate gating and risering systems are employed.

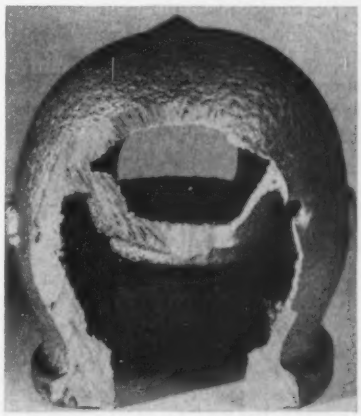
Casting Defect Is Not Blow

A difference of opinion has arisen in our foundry on the source of the "blow" in the enclosed casting. Eliminating the other faults, such as shifting, we would like to know whether the blow was caused by the mold or the core, and your reasoning for the decision. Can the direction of the blow be determined by the conical shape of the hole? You will note that the base of the cone-shaped hole is on the exterior, and the apex is on the inside or cored surface with a thin section protruding inward at that point. This condition makes it appear that the pressure building up on the outside found a weak point to penetrate, causing the wall to spread thin and the hole to narrow at that point.

While we are inclined to agree with your premise that the surface appearance around the edge of a blowhole is indicative of the direction of the gas source, in this instance we doubt that the defect is a blow.

We suspect that the trouble is a cold shut resulting from the formation of the extremely constricted cross-sectional area—caused by an abnormal shift of the core—in combination with temperature loss in the metal. A more positive identification of the cause of the defect might have been made if the casting had been examined just after it came from the mold rather than in the highly cleaned state in which it was received. Cleaning operations often remove tell-tale indications which aid in identification of defects.

As indicated earlier, the surface appearance around the hole may be a guide to the point of entry of the gas, but it is not infallible as an indication of whether or not the hole is a blow. In some cases a shrink area will pull in the wall of a casting, resulting in a depressed or dimpled effect around the hole and having the earmarks of a blow. Examination of the interior by fracturing the casting across the hole, however, shows the pinetree-like dendritic crystalline formation on the walls. Use of a low-power



Core shift makes wall quite thin

magnifying glass will aid in the identification.

Walls of blowholes usually are somewhat smooth and the surfaces may be bright and shiny or dull and discolored. Holes with bright interior surfaces usually are associated with coreblows since the gases are reducing in nature. Those with dull and/or discolored surfaces are associated with mold gases which contain moisture and cause oxidation. Again it should be pointed out that these indications are not absolute but they apply in most cases. Sometimes considerable detective work is required to pin down definitely the cause of a blow.

Effect of Moisture in Coke

To what degree does excessive moisture in the coke used in the cupola produce or favor porosity in castings poured?

Moisture in the coke used in cupola operation often is blamed for porosity or blowholes in castings. Application of a little common sense, however, will indicate that the coke contains little if any moisture after it has descended a short distance into the cupola, and the farther the descent the less likelihood of moisture being present.

Usually the bed of coke in the cupola is ignited thoroughly, which means that no moisture is present. Additional coke placed on the bed to bring it to the desired height is penetrated rapidly by the ascending, extremely hot gases, and any moisture is driven off.

The same thing occurs with succeeding coke charges. Moisture is driven off higher and higher in the cupola as it is filled with the coke and iron charges. That sufficient temperature is present to drive off moisture in the upper portion of the cupola is indicated by the fact that near the charging door the effluent gases are at a temperature of around 900° F. Of course, heat is required to drive off the moisture, and theoretically more coke will be required to attain the same temperature in the iron than when moisture-free fuel is used.

A similar situation prevails if the air blown into the cupola contains high moisture. In the summer when the air is humid, many foundries increase the amount of coke in the splits to attain the desired iron temperature. Foundries producing light-sectioned castings such as piston rings find that high humidity results in hard areas in the castings. To avoid this condition most of these foundries use equipment which supplies air with a uniformly low moisture content.

Enclosing Area Under Cupola

When we drop the bottom of our cupola, considerable dust is raised in the area around it. Since we intend to install a new cupola shortly, we are considering walling in the lower portion from bottom plate to floor with brick or steel plate to eliminate the dust problem. The drop containing coke, iron, slag, etc., would fall into a cart which would be hauled away. Have you any suggestions?

Your idea of enclosing the space beneath the cupola is used on some cupolas, and it functions quite satisfactorily in eliminating the dust problem. The enclosure may be brick, concrete, or steel plate, and usually encloses the front or spout

section and two sides, leaving the back or slagging side open for removal of the drop.

Since you are building a new cupola, we suggest heavy concrete walls on which the cupola is constructed. The walls should leave a space not less than 6 ft high under the cupola to permit access for usual repair without stooping. Sides of the enclosure should be located so that the doors when dropped can swing without striking them.

Although a cart of some type can be used to catch the drop, it probably will be simpler to use a "drag" or open frame constructed of steel bars ½ x 3 in. It is made in the form of a grid with spacing of 8 to 10 in. between the steel bars. It is placed in position under the cupola just prior to dropping the bottom, and is covered with a layer of dry sand. After the drop is made, the drag and contents are pulled from beneath the cupola to an area where it can be left to air cool or be quenched with water.

Handling Aluminum Bronze

In our foundry in France we have to produce some impellers for centrifugal pumps which have to resist seawater. Average weight of the castings is 1120 lb and the thickness varies from 1 to 2 in. The alloy to be used contains 82 per cent Cu, 1.5 per cent Mn, 5 per cent Ni, 3 per cent Fe, and 8.5 per cent Al. Metal will be melted in pot furnaces, and we will appreciate information on melting procedure, pouring temperature, etc. Also we would like to know if there is some other bronze which will resist sea water attack.

This alloy is one of the several which are classified under the designation nickel-aluminum bronze. In common with all copper-base alloys, it tends to absorb gas during melting. Consequently, it should be melted as rapidly as possible to minimize the length of time it is subjected to the furnace atmosphere, and removed from the furnace as soon as it has reached the desired temperature. That temperature should be only sufficiently above the pouring temperature to permit handling from the furnace to the mold side. The pouring temperature should be between 2000 and 2100° F.

Furnace atmosphere should be on the oxidizing side, but not extremely so. There is considerable difference of opinion relative to the use of covers and fluxes. Some people recommend the use of charcoal, but unless absolutely dry, it will introduce gas into the metal. Although glass as a cover will prevent the entrance of furnace gases, it also will prevent movement of gases out of the metal. Indications are that the only fluxes of value are the fluoride type, and they tend to form fluid slags that are difficult to remove and also attack the crucible.

Since the alloy contains aluminum, the molten metal is covered with an aluminum oxide skin which should be disturbed no more than is necessary. If any stirring is required, the stirrer should be pushed slowly into the bath and moved with an easy pumping action from the bottom. When skimming, the skimmer should be pushed beneath the surface and raised slowly so that the aluminum oxide skin is not broken and stirred into the melt. Skimming should be held to a minimum.

Gating and risering should hold turbulence to a minimum, and it is preferable to introduce the metal at the lowest point. Some foundries use horn gates, with the large end of the horn attached directly to the casting. Others use a horn gate opening into a riser close to the casting cavity and a side gate from the riser into the casting. Castings should have ample risers for feeding, and chills must be used to obtain soundness in areas where risers cannot be applied.

Among other bronze alloys which withstand seawater attack you might consider alloys containing a much higher nickel content than the one you mention. One contains 12 per cent Ni, 1 per cent Mn, 0.6 per cent Fe, 1.5 per cent Al, and remainder Cu. Another contains 12 per cent Ni, 1 per cent Mn, 1.2 per cent Fe, and remainder Cu. The first alloy shows a tensile strength around 95,000 psi and the other 45,000 psi.

Some information on these alloys is available in "Production and Preparation of Aluminum Alloyed Cast Cupro Nickel" by G. L. Lee in *Transactions* of the American Foundrymen's Society, 1957.

FOUNDRY Index Is Ready

Index to FOUNDRY, Volume 87, listing by title, subject matter, and author the editorial material published during 1959, is ready.

Readers find the index a handy reference to various phases of foundry practice, new techniques, and recent developments in the industry and a quick means of locating information published during the year.

Copies may be obtained without charge by directing requests to FOUNDRY, Penton Building, Cleveland 13, Ohio.

Mold Needs Vents on Bottom

We make a number of castings poured in open-sand molds, and notice that their upper surfaces show a large number of holes while the other sides are free from such holes. Over-iron from the ladles or cupola poured out on the floor does not show the holes, but the pig iron used shows holes on the upper surface. Can we make a ladle addition which will eliminate the appearance of the holes?

Although open-sand molding eliminates the work of making a cope and the possibility of defects such as blows, dirt, buckles, scabs, etc., it does not mean that the castings will be defect-free if good molding practices are neglected. Attention must be given to the sand used in the mold enclosing the sides and bottom to see that it possesses satisfactory permeability, is not too moist, and that it is not rammed too hard.

When molten metal comes in contact with the sand, gases are generated and must be able to escape through the sand. Otherwise, the gases bubble through the metal and cause surface porosity or blows.

In your case we believe that the mold lacks sufficient permeability on the bottom to permit the easy escape of gas, and it bubbles up through the iron to cause a rough surface and the holes. It probably is a borderline condition, else blows would show on the bottom surface.

If you watch the surface of the rising metal as the mold is poured, you will observe a small boiling action or disturbance. We suggest venting the bottom with a wire; if a bottom board is employed, see that scratch vents across the joint extend to the flask edges.

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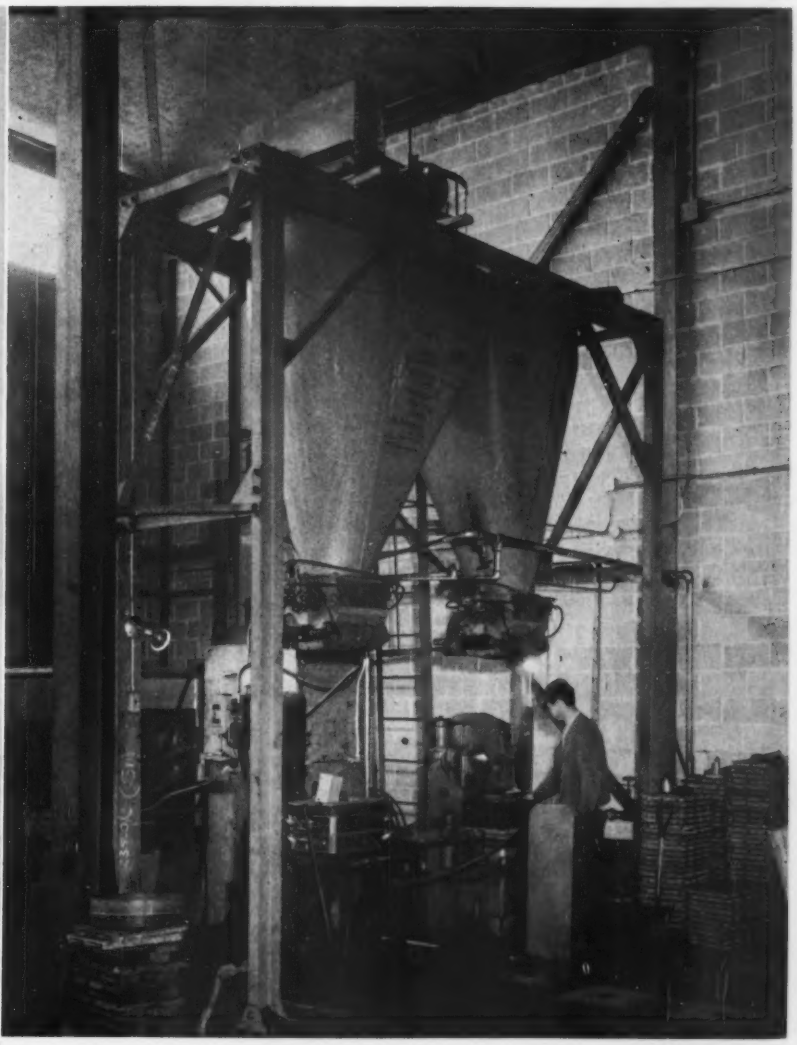
Photograph courtesy of Bell Foundry, Winnipeg, Manitoba



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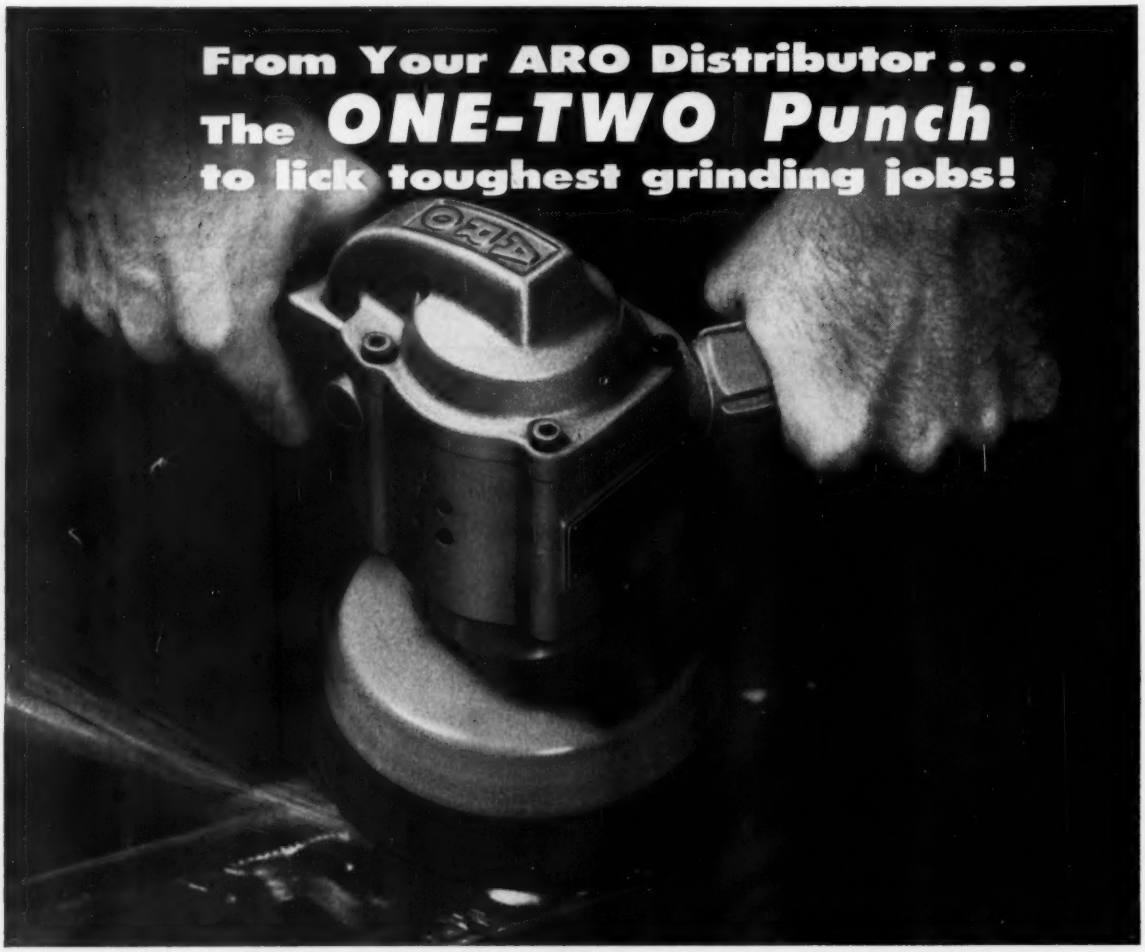

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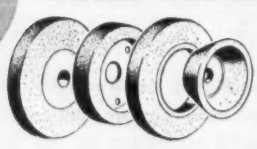

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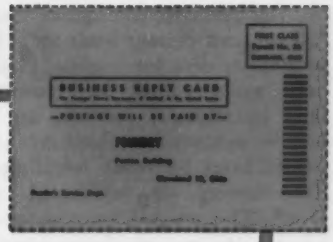


What's New in Equipment and Supplies

ELECTRIC VIBRATORS

DHE-111 Motomagnetic electric vibrator offers stepless speed control from 2000 to 10,000 vibrations per minute while operating. A mounting aspect puts the vibrational orbit close to and parallel with hopper wall to eliminate need for a reinforcing plate. Quick clamp mounts can be furnished for portability. Unit has forced air cooling and is fully-enclosed.—**Martin Engineering Co.**, Neponset, Ill.

For More Details Circle No. 450—Page 53

AIR COMPRESSOR

Type H centrifugal air compressor is designed with single-case construction and base mounting of the intercoolers to cut floor space requirements. Side connections permit up or down piping and eliminate axial inlets. For high efficiency, the line features integral intercoolers between each stage of compression. Other innovations include bearing supports cast integraly with the case for permanent alignment and back-to-back impeller design for inherent thrust balance. Six case sizes are available with 1000 to 8000 bhp and 5000 to 38,000 cfm. Each unit is a package including matching driver, intercoolers, and lubricating system.—**Clark Bros. Co.**, Olean, N. Y.

For More Details Circle No. 451—Page 53

GAGE BLOCKS

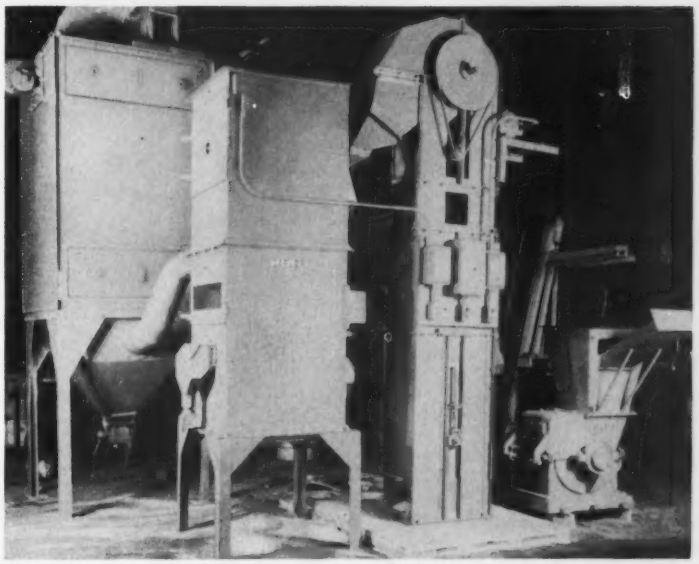
Stainless steel gage blocks for shop and inspection use are said to reduce gaging costs. Blocks have fine optical finish and extreme hardness and density of gaging faces. Greater accuracy and longer life are claimed as results of the improvements. Blocks are corrosion resistant. — **DoAll Co.**, Des Plaines, Ill.

For More Details Circle No. 452—Page 53

RECTIFIER LINES

Two new lines of 250-v, dc, silicon rectifiers are for heavy duty industrial and general purpose operations. The heavy duty rectifiers are offered in ratings from 400 to 2000 kw with standard sizes carry-

Dry Sand Reclaiming Unit Offers Flexibility



Completely dry sand reclaiming unit consists of heavy-duty crusher, elevator, mill and separator, and cleaner. Unit can be used with a vertical bucket or slanting bucket elevator or conveyor.

The unit operates at a speed of 4 tons per hour or more and is said to reclaim 75 per cent or more of sand investment. Crusher will take oil, synthetic, or CO_2 hardened cores or molds.—**Carver Foundry Products**, 1056 Hershey Ave., Muscatine, Iowa.

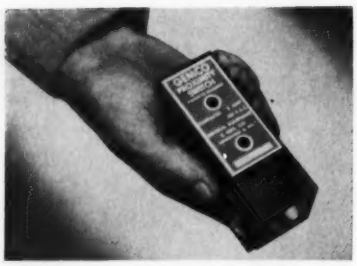
For More Details Circle No. 481—Page 53

ing 100 per cent continuous loads, 125 per cent current loads for 2 hr, or 200 per cent for 1 min. Heavy duty units consist of incoming line, transformer, rectifier, an dc breaker sections assembled on three related bases for ready installation. Transformers are self-cooled dry type. The general purpose units, 150 to 300 kw, are simple factory-packaged units available for three-phase, 60-cycle primary voltages of 208, 240, 480, or 600. Direct air cooling is employed in the general purpose rectifiers.—**Allis-Chalmers Mfg. Co.**, 1126 S. 70th St., Milwaukee 1, Wis.

For More Details Circle No. 453—Page 53

PROXIMITY LIMIT SWITCH

Proximity switch consists of an armature carrying a set of silver contacts disposed within a field of enclosed permanent magnets. The normally closed contacts are held closed by the force of that magnetic field. At the sensing of a



foreign ferrous part, the armature closes its normally open contacts. The switch contains only one moving part and requires no power input. Unit is 1½ x 1½ x 4½ in. and is sealed in a brass housing.—**General Equipment & Mfg. Co. Inc.**, Dept. TP, 116 S. Campbell St., Louisville 6, Ky.

For More Details Circle No. 454—Page 53

SELF-STORING AIR HOSE

Self-storing air hose eliminates hose reels and offers light weight, resistance to kinking, and the ability to absorb twist. Hose is made of a polyamide formula, is impervious to oils and has dimensional and chemical stability and toughness. The microfinished bore assures air flow for pressures to 200 psi. Maximum working length is 20 ft; coiled length is under 1 ft.—**Synflex Products Div., Samuel Moore & Co.**, Mantua, Ohio.

For More Details Circle No. 455—Page 53

HYDRAULIC ADJUSTER

Hydraligner provides variable positioning of a conveyor pulley for

proper belt tension and alignment. Unit consists of a hydraulic cylinder attached to a bearing housing. The piston is moved by pressure applied with an ordinary grease gun and holds its position with pressure maintained by positive action piston seals. Adjuster is adaptable to remote control through installation of hydraulic lines to stations. Unit can be used safely while conveyor equipment is in operation.—**Western Conveyor Co.**, P. O. Box 357, Boise, Idaho.

For More Details Circle No. 456—Page 53

FOUNDRY PATTERN PLATE

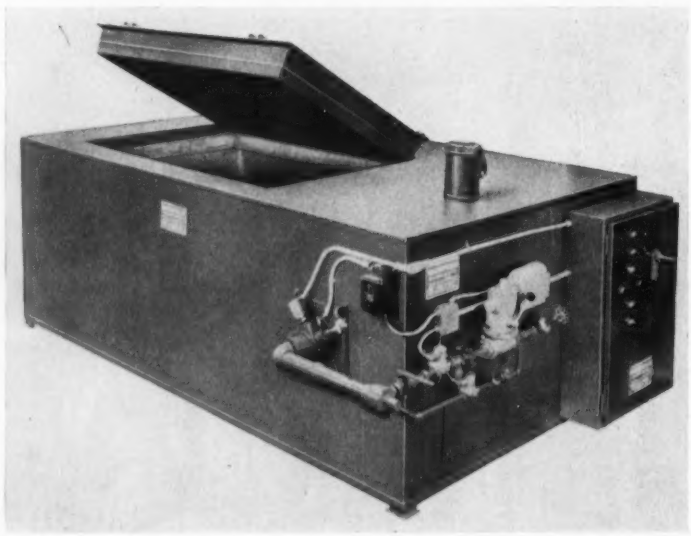
Dilecto foundry pattern plate is said to be inexpensive and lightweight, reducing handling costs. It is free from splinters and rough edges, is hard, tough, and durable. The plate is made from a strong phenolic resin. Material is available in a variety of sizes and thicknesses and can be fabricated to prints.—**Continental-Diamond Fibre Corp.**, subsidiary of Budd Co., Newark, Delaware.

For More Details Circle No. 457—Page 53

HEATING ELEMENTS

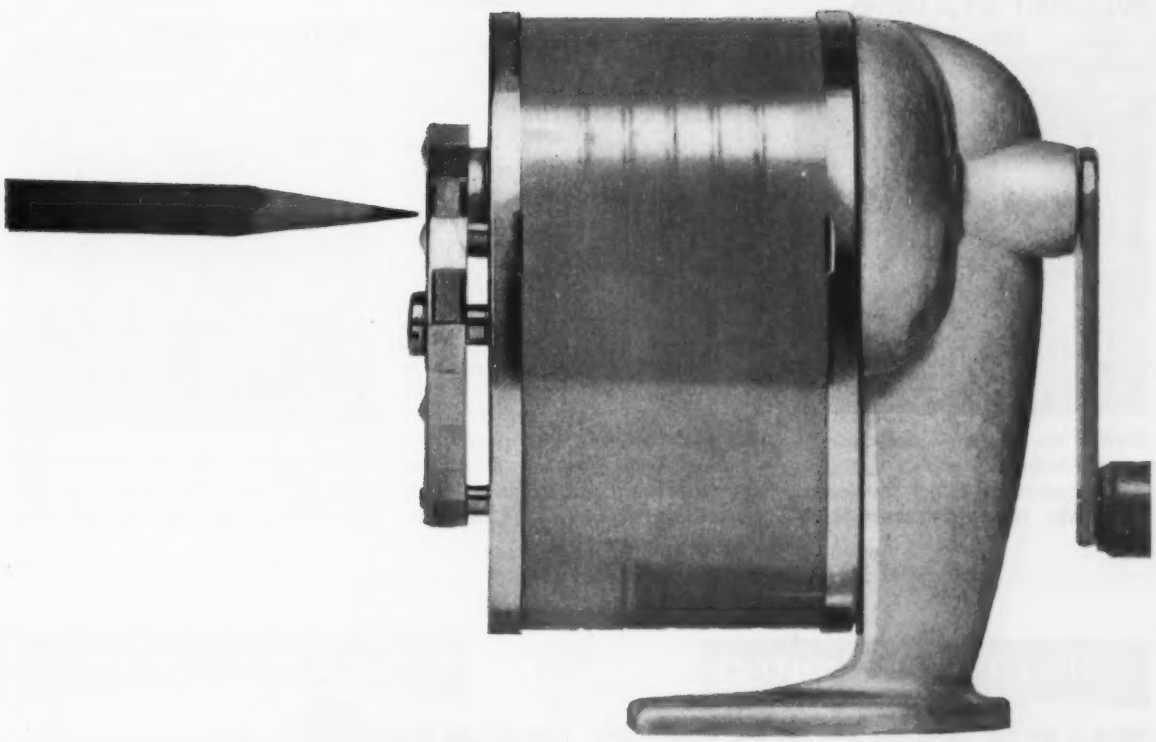
Crusilite silicon carbide furnace element provides temperatures up to 1575 to 2867° F. Elements are fabricated in one piece with the hot zone in spiral form. The units are not affected by furnace cycling and thermal shock, operate with a 40

Heat Treat Oven Features Top Loading



Top-loading oven for preheating, stress relieving, aging, air drawing, and solution heat treating has working space 3½ x 5 x 1½ ft. Heavy-duty floor grill is designed for 5000-lb load. Unit has continuous working temperatures up to 950° F. Other features include automatic temperature controls and electronic combustion safeguards. Air recirculating rate is said to be exceptionally high. Models are available gas fired or electrically heated and are shipped completely assembled and ready to operate. —**McCann Furnace Div., Foundry Equipment Co.**, 1831 Columbus Rd., Cleveland 13, Ohio.

For More Details Circle No. 482—Page 53



to make our point quickly

Take your pencil and check off *why* you should make your castings with Penolyn Core Oil. First, you are assured maximum foundry efficiency. Second, you'll find there is a grade of Penolyn Core Oil to meet the most exacting requirements of every Foundry and Core Room practice. Third, and most important —

If you require expert technical assistance or technical data regarding your present or future casting operations, just call the Penola office nearest you. Or write: Penola Oil Company, 15 W. 51st Street, New York 19, N. Y.

Penola

specify PENOLYN CORE OIL

for these 10 important casting advantages:

1. Dependable uniformity
2. Concentrated form
3. No obnoxious odor
4. Seepage eliminated
5. No crusting, green mix
6. Always clean working
7. Wide temperature range
8. Polymerized formulation
9. Minimum gas
10. Ample collapsibility

PENOLA OIL COMPANY • NEW YORK • CHICAGO • DETROIT

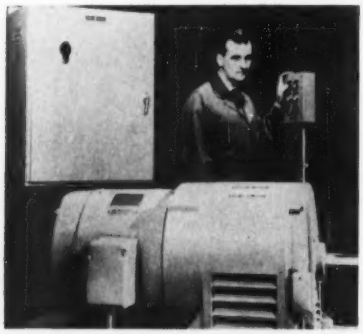
Circle 612 on Page 53

per cent voltage reserve, and age uniformly. Elements are available with over-all lengths up to 63 in. and hot zone lengths from 7 to 40 in.—**Morganite Inc.**, Crusilite Dept., 3302-3320 48th Ave., Long Island City 1, N. Y.

For More Details Circle No. 458—Page 53

ADJUSTABLE SPEED DRIVES

Kinatrol line of eddy current coupling adjustable speed drives



from 5 to 100 hp is designed for general industrial applications. Automatic control provides close speed regulation. Drive is factory tested as a package and prewired. Drive unit, control enclosure with control for both coupling and integrally-mounted alternating current motor, and operator's station are offered together. Features include improved ventilation and lubrication and new bearing arrangement to assure positive gap alignment.—**General Electric Co.**, Direct Current Motor and Generator Dept., Erie, Pa.

For More Details Circle No. 459—Page 53

TROLLEY LUBRICATOR

Jet lubrication system is for use with chainless conveyor trolley. Unit directs oil into the wheel bearings and joints with minimum of loss or dripping. Lubricator operates under approximately 40-lb air pressure.—**American MonoRail Co.**, Fourth and Franklin Streets, Tipp City, Ohio.

For More Details Circle No. 460—Page 53

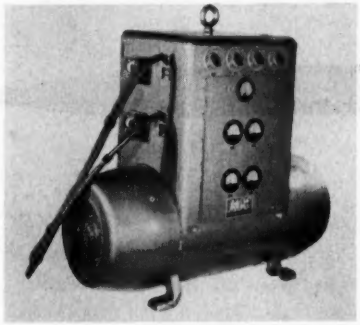
MICROPHOTOMETER

Spectroline Scanner projection comparator-microphotometer is for spectrographic analysis. Unit is designed to compare unknown spectrums with master spectrums and measure either the per cent transmission or density of spectral lines. Machine handles film or plates taken on any conventional spectrograph.—**Applied Research Laboratories Inc.**, P. O. Box 1710, Glendale 5, Calif.

For More Details Circle No. 461—Page 53

MONITOR CHARGERS

Hobart four-circuit automatic generators are for charging motorized



hand truck batteries. Motor and generator controls of the unit are housed together with four complete

EXECUTIVE REPORT #1

THEY SCRAPPED TRADITION

...to cut cleaning costs in half

Everyone from top management to the cleaning room foreman at Wahkonsa Foundry Co. endorses the change from barrel type tumbling mills to Wheelabrator airless blast cleaning of their gray iron and semi-steel castings. "We seldom get enthused or excited over any change in our production methods", says F. W. Dennis, foundry manager, "but the Super Tumblast has proven to be the ultimate in cleaning methods for our needs." His judgment in selecting the Wheelabrator has been confirmed by doubling their production rate, improving the cleaning quality, and cutting labor and operating costs squarely in half.

See how Wheelabrator Engineering can Improve Your Blast Cleaning Operation

The chances are you, too, could benefit by modernizing your blast cleaning with Wheelabrator equipment and engineering. Call your nearest Wheelabrator office or write to **Wheelabrator Corp., 505 S. Byrkit St., Mishawaka, Ind. In Canada, P. O. Box 490, Scarborough, Ont.**

charging circuits in a dead front, monitor-top control cabinet. After connection, charging is started by turning a timeclock knob to charge position. Unit charges lead-acid batteries in 8 hr and nickel-alkaline batteries in 7 hr.—**Motor Generator Corp.**, West Water Street, Troy, Ohio.

For More Details Circle No. 462—Page 53

INDUSTRIAL TIRES

Tight, durable, uniform, laminated industrial tire is made by

special construction which is said to increase strength of the tire about 50 per cent. Sizes range from 4.00 x 6 to 9.00 x 28. Size 12.00 x 24 is available on special order. Illustrated are 6.00 x 9 tire on a split wheel and 7.50 x 15 mounted on a flat base rim.—**Mitchell Industrial Tire Co. Inc.**, P. O. Box 468, Chattanooga, Tenn.

For More Details Circle No. 463—Page 53

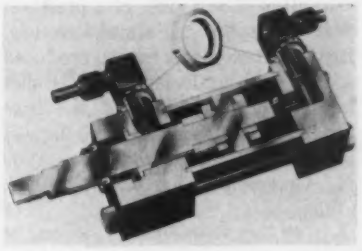
FURNACE ACCESSORIES

Six functional accessory groups adapt Model 2100 Thermolyne furnace for use as a salt bath, oil bath, melting, vertical muffle, or crucible furnace. Included are two special alloy stainless steel pots with cover for liquid heating to 1000 to 1600° F; a safety lifting handle for the pots; a perforated, stainless steel, small-parts basket with lifting handle; a perforated, stainless steel skimmer for removing sludge or crust; a graphite melting ladle for use to 1700° F with nonslip lifting handle; a high-temperature refractory chamber liner; and a heavy, well-insulated, refractory chamber cover. Economy of initial purchase and space saving are features of this arrangement.—**Thermo Electric Mfg. Co.**, 622 Huff St., Dubuque, Iowa.

For More Details Circle No. 464—Page 53

POWER CYLINDER SEALS

Port seals which provide fast positioning and protection from



overtightening damage are furnished as standard equipment on all regular models of the company's air and hydraulic cylinders, boosters, and accumulators. The device consists of a hexagonal steel threaded nut with a threaded Teflon sealing insert said to be impervious to chemical or corrosive action. Seals are of the pressure-sealing type specified by J.I.C. Standard H6.2.2. —**Miller Fluid Power Div., Flick-**

EXECUTIVE REPORT #2

When Does a Blast Cleaning Machine Become Obsolete?

A good production tool, including a blast cleaning machine, becomes obsolete whenever a better tool becomes available to do its job at lower cost.

The management of Canton Malleable Iron Co. took this progressive viewpoint in evaluating their two old batch-type blast machines — both still working well, but having a hard time keeping up with increased cleaning demands.

They replaced both machines with one 14 cu. ft. Wheelabrator Super Tumblast. The savings made more than paid for the new equipment in less than two years. Savings of 16 man-hours daily in direct labor. Savings in reduced maintenance costs. Savings in record low abrasive consumption. And savings in production time, since the Super Tumblast handles all production cleaning many times faster than the two older machines together.

Wheelabrator takes the Guess-Work Out of heavy-duty blast cleaning

With approximately 200 Super Tumblasts in operation, only Wheelabrator has the necessary experience in solving these heavy-duty blast cleaning problems. Write for Bulletin 145-D giving documented performance results.

Wheelabrator Corp., 509 S. Byrkit St., Mishawaka, Ind.
Canadian Division: P.O. Box 490, Scarborough, Ont.

WHEELABRATOR
AIRLESS BLAST EQUIPMENT

Reedy Corp., York and Thorndale Roads, Bensenville, Ill.

For More Details Circle No. 465—Page 53

GRANITE SURFACE PLATES

Granite surface plates are designed for rapid three-dimensional checking by providing accurate angles that allow 2 or 3 sides of a precision part to be checked simultaneously. Inside square plates can be produced with 1 or 2 vertical sides. All angles formed by the sides and the base are held to an accuracy of 90 degrees ±3 sec.—**Herman Stone Co.**, 1860 N. Gettysburg Ave., Dayton 27, Ohio.

For More Details Circle No. 466—Page 53

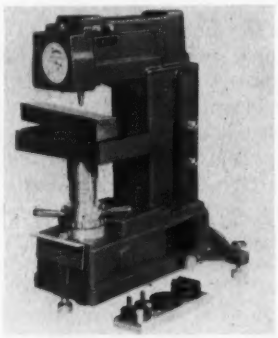
THERMOCOUPLE PROBES

Thermocouple probes for continuous measurement of furnace and flue gas temperatures can operate to 3100° F. The rugged units are available with or without water cooling. Parts of the uncooled probe are coated with molybdenum disilicide to prevent oxidation. Accuracy of the probe is better than 2 per cent and time constant is faster than 0.8 sec. The cooled probe is designed for variable immersion applications and can be made in long lengths.—**Aero Research Instrument Co. Inc.**, 315 N. Aberdeen St., Chicago 7, Ill.

For More Details Circle No. 467—Page 53

MOTORIZED HARDNESS TESTER

Motorized Kentrall hardness tester automatically removes major testing loads. This machine eliminates much of the effect of operator technique, gives greater reproducibility of test results, and cuts down on operator fatigue. Unit is available for either regulator or superficial testing or for both.—**Torsion Balance Co.**, Clifton, N. J.



For More Details Circle No. 468—Page 53

HANDLING TRUCK

Toter truck for handling tote pans, kegs, and other small heavy packages lifts loads by placing the toe plate under the load and lifting with a downward motion on the handle. Hand grips are placed in the best natural position for minimum effort. Curved design of the handle adds to the operator's safety. Truck is 36 in. high by 10½ in. wide., weighs 44 lb and can lift up to 350 lb.—**Colson Corp.**, Seven South Dearborn, Chicago, Ill.

For More Details Circle No. 469—Page 53

MEDIA CLASSIFIER

Portable automatic media classifier is claimed to reduce barrel finishing costs. Three grades of media, in quantities up to 6000 lb per hour, can be resized automatically. Sturdy hoist pans under each screen collect sized media from the 10-cu-ft hopper. Large bin

EXECUTIVE REPORT #3

DRY CLEANING ELECTRIC FURNACE FUME

Control of air pollution is management's concern — your concern. It's a matter of economics as well as community and employee relations. And cloth filtration, as employed by Wheelabrator® Dustube® equipment, is the most effective and economical way to eliminate air pollution. In control of electric furnace fume, for example, more experience is available at Wheelabrator than anywhere else. Efficiencies up to 99% are usual for Dustube systems in this application.

No air pollution code is too strict for Wheelabrator Dustube Collectors

Bulletin No. 562-D illustrates how industry relies on Dustube Collectors for efficient dust and fume control. Write to Wheelabrator Corp., 505 S. Byrkit St., Mishawaka, Ind. In Canada, P. O. Box 490, Scarborough, Ontario.

stores oversize media. Interchangeable screens are used to classify a wide range of sizes. Hopper has an adjustable metering chute for controlling the flow of media into the drum.—**Almco-Queen Products Div., King-Seeley Corp.**, Albert Lea, Minn.

For More Details Circle No. 470—Page 53

MICROMETER

Series No. 256 disc type micrometer designed to measure the thickness of narrow sections can be used for 0.015-in. clearances. Featured are thin, tapered anvil and spindle discs, ½ in. diam, 1/16 in. thick at the center. Unit has satin chrome finish with one-piece frame of drop forged steel. Lock nut or ratcheted stop is optional. Micrometer is available in 0 to 1 in. with graduations in thousandths of an inch.—**L. S. Starrett Co.**, Athol, Mass.

For More Details Circle No. 471—Page 53

PARTING POWDER

Micro-Part nonsilica parting powder is lightweight and low-cost. It is chemically inert and is used to part core and molding sand for all metals. The fine, waterproof powder even adheres to vertical surfaces and and is particularly useful in drawing CO_2-hardened cores from core-boxes. Material works well with hot sand. It is applied by shaking from a proper mesh shake-bag. Product is packed in 50, 100, and 175-lb drums.—**Frederic B. Stevens Inc.**, 1800 18th St., Detroit, Mich.

For More Details Circle No. 472—Page 53

SAFETY LATCHES

Line of safety latches for converting standard hoist hooks to safety

hooks includes eight sizes for larger hooks. Latches now are available in hook sizes ¼ through 10 tons. The safety device has two major parts—a clamp-on collar and a spring-loaded latch which fits into the hook opening. The collar conforms easily to any hook-shank shape. Only hand tools are required to fit the latches on hooks.—**Harrington Co.**, Gravers Road, Plymouth Meeting, Pa.

For More Details Circle No. 473—Page 53

BANDSAW BLADE

Jet Band bandsaw blade containing vanadium carbide reportedly is harder than a grinding wheel or than carbon bandsaw blades. It is said to have comparatively high fatigue resistance and flexibility, exceptional cutting power, and abrasion resistance.—**Millers Falls Co.**, Greenfield, Mass.

For More Details Circle No. 474—Page 53

ELECTRIC VIBRATORS

RC line of vibrators aid in moving materials from outdoor bins—at any time of the year—and from hoppers to conveyor belts, with accurate measurement. Units use the rotating eccentric shaft principle of

EXECUTIVE REPORT #5

DON'T SAVE PENNIES TO LOSE DOLLARS

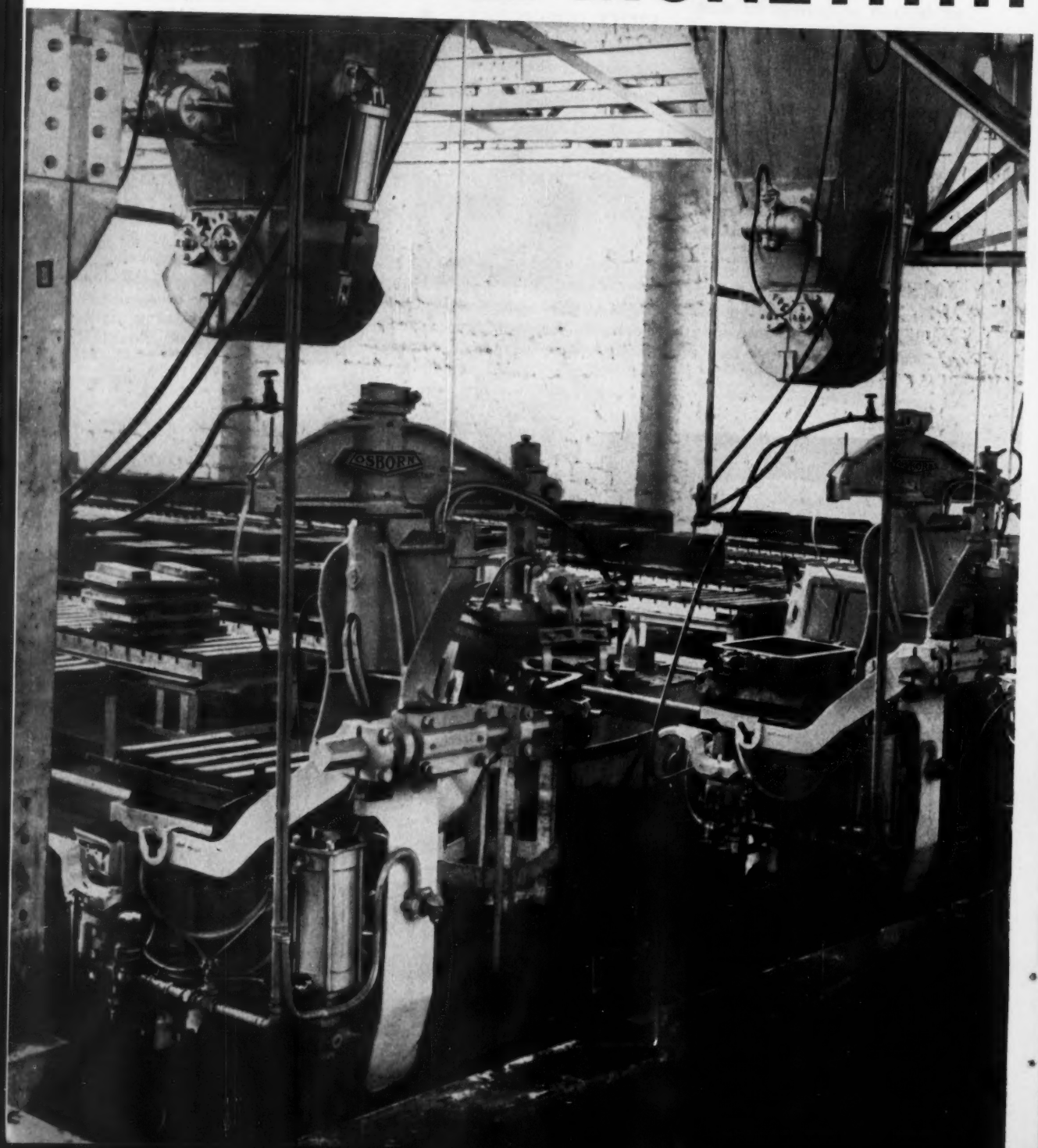
the lowest-priced abrasive can be an expensive bargain

Your real concern is the *ultimate cost* of the blast cleaning abrasive you use, not its price per ton. Abrasive quality and performance controls your actual blast cleaning costs. Lower priced abrasives can cost you more, in excessive shot consumption, lower production volume, poor quality of work and excessive machine maintenance. In case after case, high quality Wheelabrator Steel Shot has proven to be the *lowest-cost* abrasive, all factors considered.

You can prove the savings you'll make with Wheelabrator Steel Shot

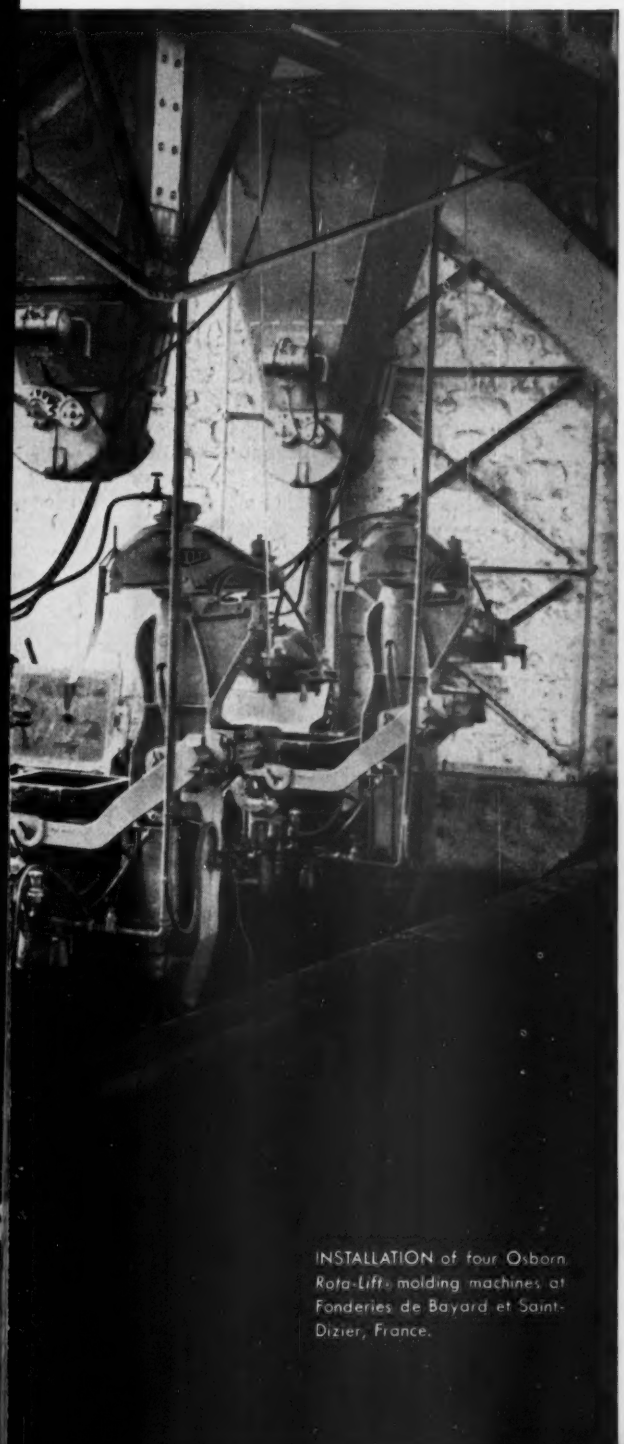
Your Wheelabrator Abrasive Engineer will demonstrate the performance of Wheelabrator Steel Shot in your own plant. For details write to Wheelabrator Corp., 505 S. Byrkit St., Mishawaka, Ind. In Canada, P.O. Box 490, Scarborough, Ontario.

MACHINES THAT MAKE MONEY.....



Mechanizes large match-plate molding to deliver top quality at lowest possible cost

.....OSBORN ROTA-LIFT®



INSTALLATION of four Osborn *Rota-Lift*® molding machines at Fonderies de Bayard et Saint-Dizier, France.

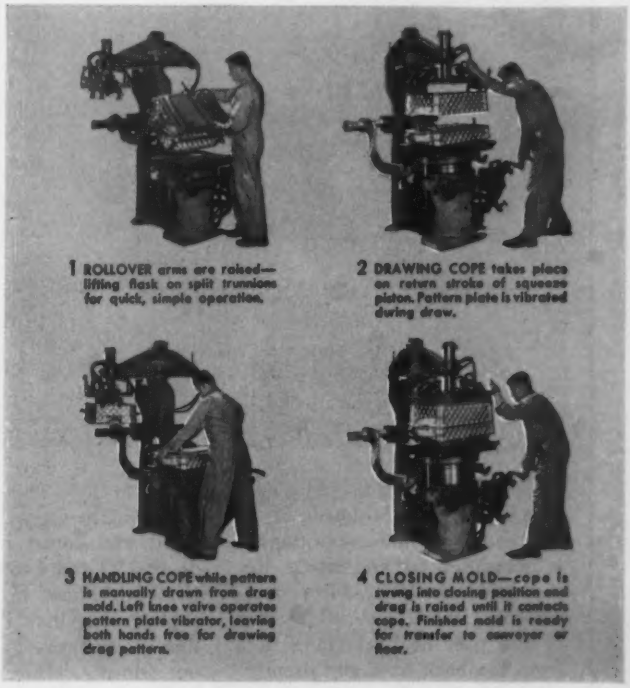
Moneymakers for the foundry . . . Osborn's advanced *Rota-Lift*® molding machines.

Molding from large match-plate patterns today with an Osborn *Rota-Lift* means a *mechanized* operation that pays off in superior castings . . . at lowest cost.

One man . . . one *Rota-Lift* machine easily handle all five major match-plate molding operations—jolt . . . roll . . . squeeze . . . draw . . . and close. Able to handle a wide range of flask sizes, *Rota-Lift* machines are also quickly adjustable for rapid short-run job changeovers.

The *Rota-Lift* is ideally suited and a real asset to any jobbing or semi-production foundry. An Osborn Sales-Engineer will recommend the right model *Rota-Lift* to inprove your competitive position . . . for a *bigger* share of the casting business now.

Write us for full details—and your copy of *Rota-Lift* Folder 25-A.


1 ROLLOVER arms are raised—lifting flask on split trunnions for quick, simple operation.
2 DRAWING COPE takes place on return stroke of squeeze piston. Pattern plate is vibrated during draw.
3 HANDLING COPE while pattern is manually drawn from drag mold. Left knee valve operates pattern plate vibrator, leaving both hands free for drawing drag pattern.
4 CLOSING MOLD—cope is swung into closing position and drag is raised until it contacts cope. Finished mold is ready for transfer to conveyor or floor.

Circle 617 on Page 53

THE OSBORN MANUFACTURING COMPANY
5401 Hamilton Avenue • Cleveland 14, Ohio

OSBORN®

MEMBER FEMA

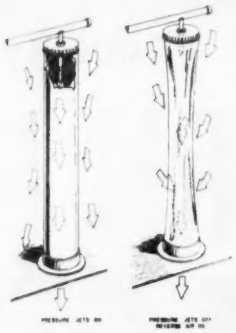
MOLDING MACHINES • CORE BLOWERS
METAL FINISHING MACHINES • INDUSTRIAL BRUSHES

developing vibration. The self-contained vibrators are completely enclosed and have no pulleys or belts. With built-in motor and eccentrics, the units are available in 3-phase alternating current in all standard voltages. Working frequency is 60 cps.—**Cleveland Vibrator Co.**, 2828 Clinton Ave. W., Cleveland 13, Ohio.

For More Details Circle No. 475—Page 53

DUST COLLECTOR

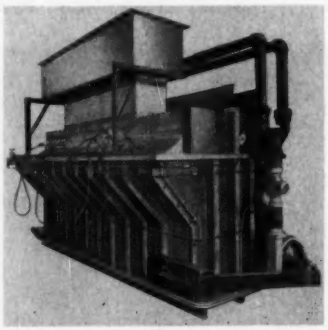
Type CO cloth tube collector has been developed for use with high temperature fume and dust emissions. Designed for use with glass filter fabric to permit efficiency at temperatures to 550° F, the collector can employ any type of filter fabric. Dust is collected on the inside surfaces of the filter tubes. A simple jet inside each tube provides short blasts of higher pressure air, alternating with a small amount of reverse airflow from the main fan. This action partially collapses the tubes, cleans the filter surfaces, and deposits the residue into storage hoppers for disposal. Collector is controlled by an adjustable electric program timer.—**Pangborn Corp.**, Hagerstown, Md.



For More Details Circle No. 476—Page 53

SALT BATH FURNACES

Gas or fuel-fired salt bath furnaces operate to temperatures of 2300° F. They offer economy and the heat treating advantages of molten salt immersion. Units are suitable for casting and other heavy duty work involving high tonnage volume. Salt is heated by radiation to the bath surface in an enclosed chamber without using any metal for heat transfer. Circulation, obtained by an air bubbler agitator, assures no more than 10-degree Fahrenheit variation in any part of the bath working area. Rigid walls are enclosed in a reinforced steel casing.—**Ajax Electric Co.**, Frankford and Delaware Avenues, Philadelphia 23, Pa.

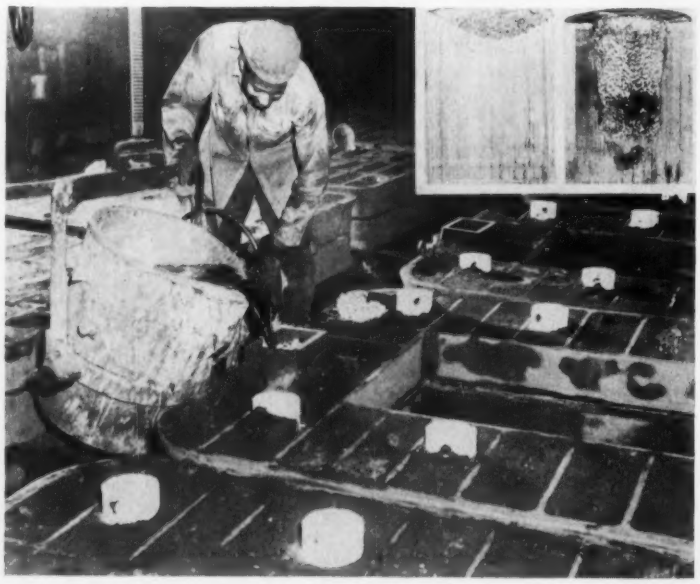


For More Details Circle No. 477—Page 53

WELDING GUN

Aircomatic, gas-shielded, metal-arc process welding gun for use on mild steel using CO_2 has a continuous duty rating of 600 amp dc when using buried arc CO_2 techniques. The gun is air-cooled and can accommodate hard welding wires ranging from 0.035 to 3/32

Insulated Riser Sleeve Gives Sound Castings



Ris-A-Sleeve riser sleeve for nonferrous castings is insulated to give sound, economical castings of aluminum, brass, and bronze. Reduced transfer of heat from molten riser metal assures freezing of the riser last, facilitates uniform feedback from the risers to all portions of the mold, and permits use of smaller risers.

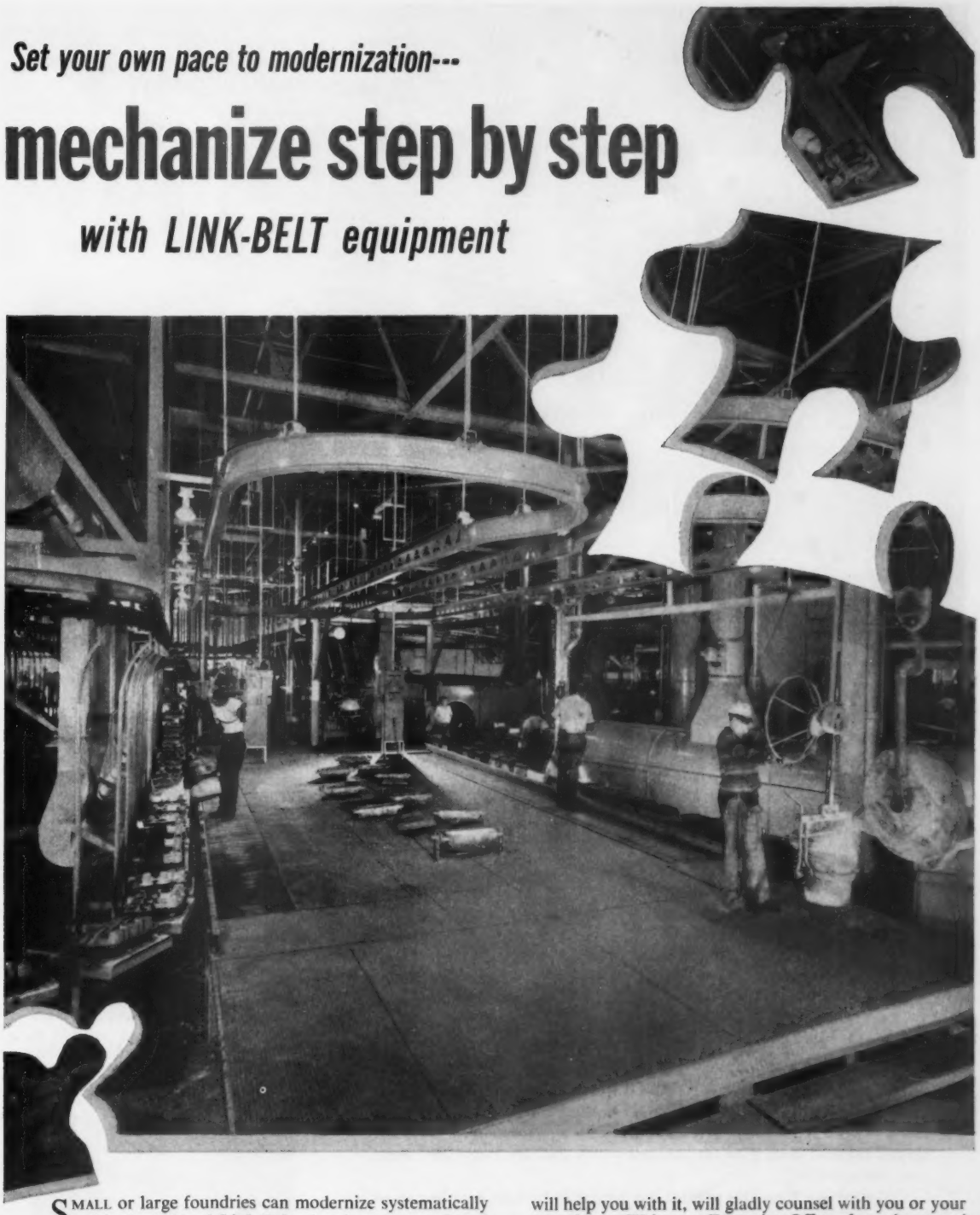
The sleeve offers a thermal diffusivity of about 0.04, transverse strength of 40 psi minimum, and linear shrinkage, moist to dry, of 0.011 in. per 8-in. length. It weighs 9 lb per cu ft and comes in 1 5/16 to 4½-in. ID and 4 to 8-in. lengths. Wall thickness of all sizes is slightly more than 1 in. Illustration shows sleeve in a mold during pouring. Inserts show riser cross sections from identical brass pourings with Ris-A-Sleeve, left, and a conventional sleeve, right. —**Johns-Manville**, 22 E. 40th St., New York 16, N. Y.

For More Details Circle No. 483—Page 53

Set your own pace to modernization---

mechanize step by step

with LINK-BELT equipment



SMALL or large foundries can modernize systematically with the help of Link-Belt planning . . . perfected through 50 years of serving foundries. Industry's broadest line of conveyors and preparation machinery allows you to add equipment where it's needed most . . . *piece by piece at your own pace.*

Start anywhere! Whether it's the handling of sand, cores, molds, castings . . . or a complete system—Link-Belt will furnish and install equipment that results in lower costs, more efficient operation, better working conditions.

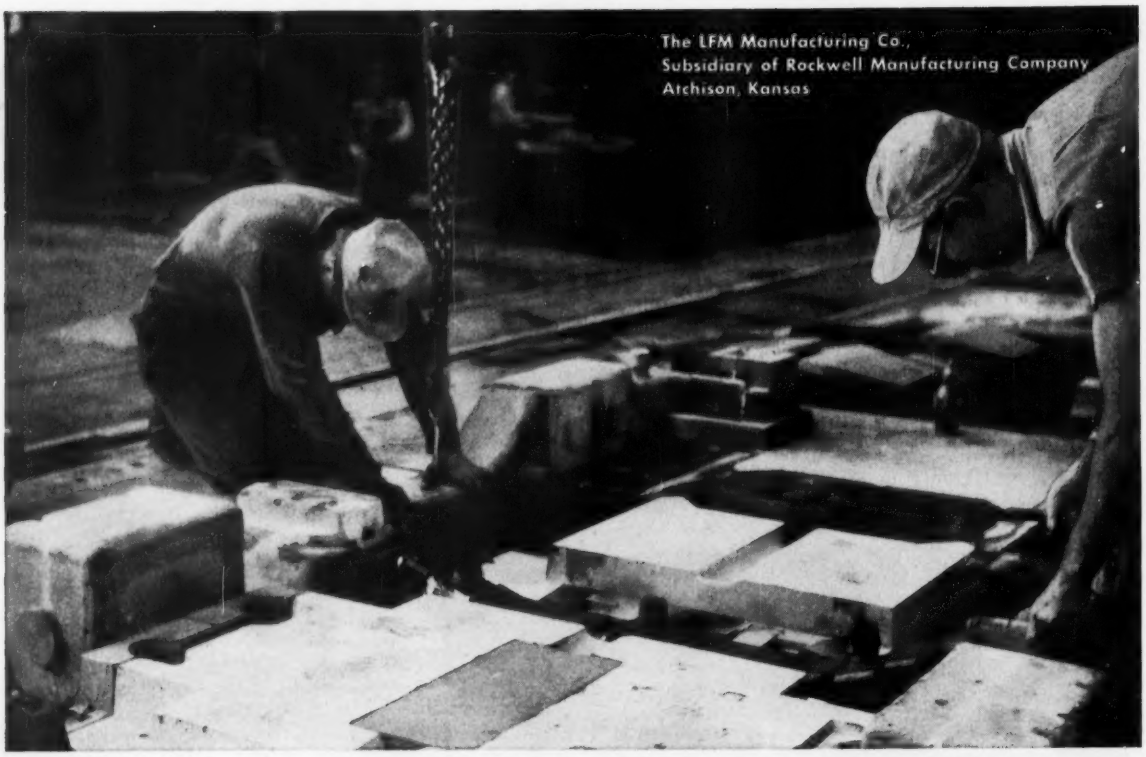
For best results, step-by-step mechanization requires a sound, long-range program. Our foundry specialists will help you with it, will gladly counsel with you or your consultants. Write our Executive Offices for color-sound film, "Foundry Flexibility," showing the benefits of mechanization. It will be lent on request.

LINK-BELT

CONVEYORS AND PREPARATION MACHINERY

MEMBER FEMA

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World. 15.01



Largest Electric Steel Foundry Casts Cities Service in Major Role

The LFM Manufacturing Company, Inc. praises "remarkable versatility" of Cities Service Core Oils

Today, a typical sampling of the work at The LFM Manufacturing Company might include: a one-piece railroad truck casting, 20 feet long and eight feet wide . . . giant 13,000 pound crankcase castings for 16-cylinder diesel generators . . . or intricate pump castings.

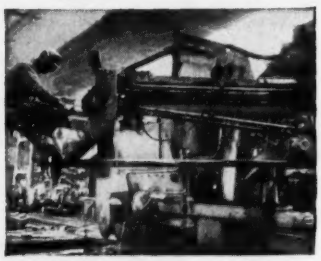
As might be expected, all of this requires one of the largest core rooms, covering 20,000 square feet of area, with 13 huge core ovens, scores of coremakers and a good many core oils.

But what fascinates LFM is not how many but *how few* different core oils they require, considering their vast production. Here they're quick to praise the remarkable versatility of Cities Service Delco #938.

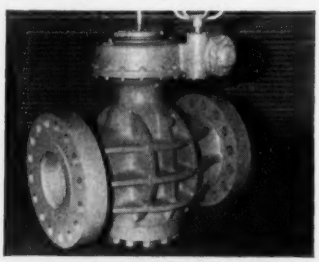
For at LFM, Cities Service Delco #938 is used in a surprisingly wide range of core applications with equally satisfactory results. Cores for the largest railroad casting or the smallest pump part are frequently made with this same oil.

Cities Service Core Oils provide this versatility because they can stand the long baking necessary for large cores and give the fast bake so vital to small cores. Shakeout properties are always excellent; smoke is minimal.

If you're looking for core oils of high quality and wide application, talk with a Cities Service Core Oil Specialist. Call the nearest office or write: Cities Service Oil Company, 20 N. Wacker Drive, Chicago 6, Ill.



Sandslinger is employed at LFM to swing out over giant molds and blast sand into them. Machine has capacity of 60 tons of sand per hour.



High Pressure Valve Body exemplifies diversification. LFM now makes parts for steel rolling mills, rock crushers, electric generators, as well as railroad parts. Cores for many are made with one oil—Cities Service Delco #938.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

Circle 619 on Page 53

in. fed from standard wire feeders. Unit is equipped with lever-type trigger for easy operation and a gooseneck nozzle assembly for areas that are hard to reach.—**Air Reduction Sales Co.**, division of Air Reduction Co. Inc., 150 E. 42nd St., New York 17, N. Y.

For More Details Circle No. 478—Page 53

PNEUMATIC GRINDERS

Series 905 portable pneumatic grinders now consist of heavy duty horizontal grinders, wire brushing machines, and horizontal buffers for wheels up to 8 in. Four speeds are offered—6000, 4500, 4100, and 3100 rpm. Handles can be straight, lever, or grip type. Featured are lightweight, one-piece aluminum housing; four prelubricated, sealed spindle bearings; steel inserts in all housing threaded holes and bearing bores; and hardened, ground, and honed cylinder.—**Thomas C. Wilson Inc.**, 21-11 44th Ave., Long Island City 1, N. Y.

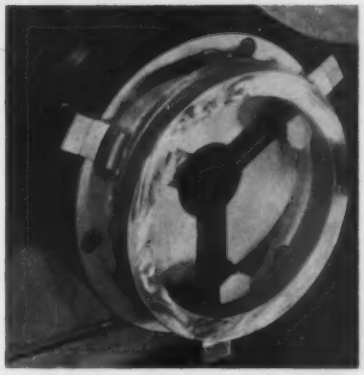
For More Details Circle No. 479—Page 53

THERMOCOUPLE WIRE

Insupack insulated thermocouple wire is said to be effective in severe mechanical loading or vibration applications. The wire is sheathed in metal tubing and is supplied in all base metal calibrations (standard ISA symbols T, J, and K, and Chromel-Constantan) in single or duplex pairs. Standard wire diameters are $\frac{1}{8}$, 3/16, and $\frac{1}{4}$ in. in four types of insulation.—**Pyrometer Co. of America Inc.**, Penndel, Pa.

For More Details Circle No. 480—Page 53

Machine removes gates and risers from castings which can be chucked



Chucked casting is shown with risers still attached (above) and after their removal (below)

Abrasive Cutoff Machine
Removes Gates and Risers

● ABRASIVE cutoff machine quickly and economically removes gates and risers from castings which can be chucked. Castings may have one, two, or more risers so long as axes are perpendicular to the cut.

An adaptation of the company's standard-type, modular, cut-machining units, the machine is available in models which use 16, 18, 20, or 26-in. standard cutoff wheels. Cutting unit can be made to perform either wet or dry. Surface speed is 13,600 fpm for dry cutting and 6000-8000 fpm for wet cutting.

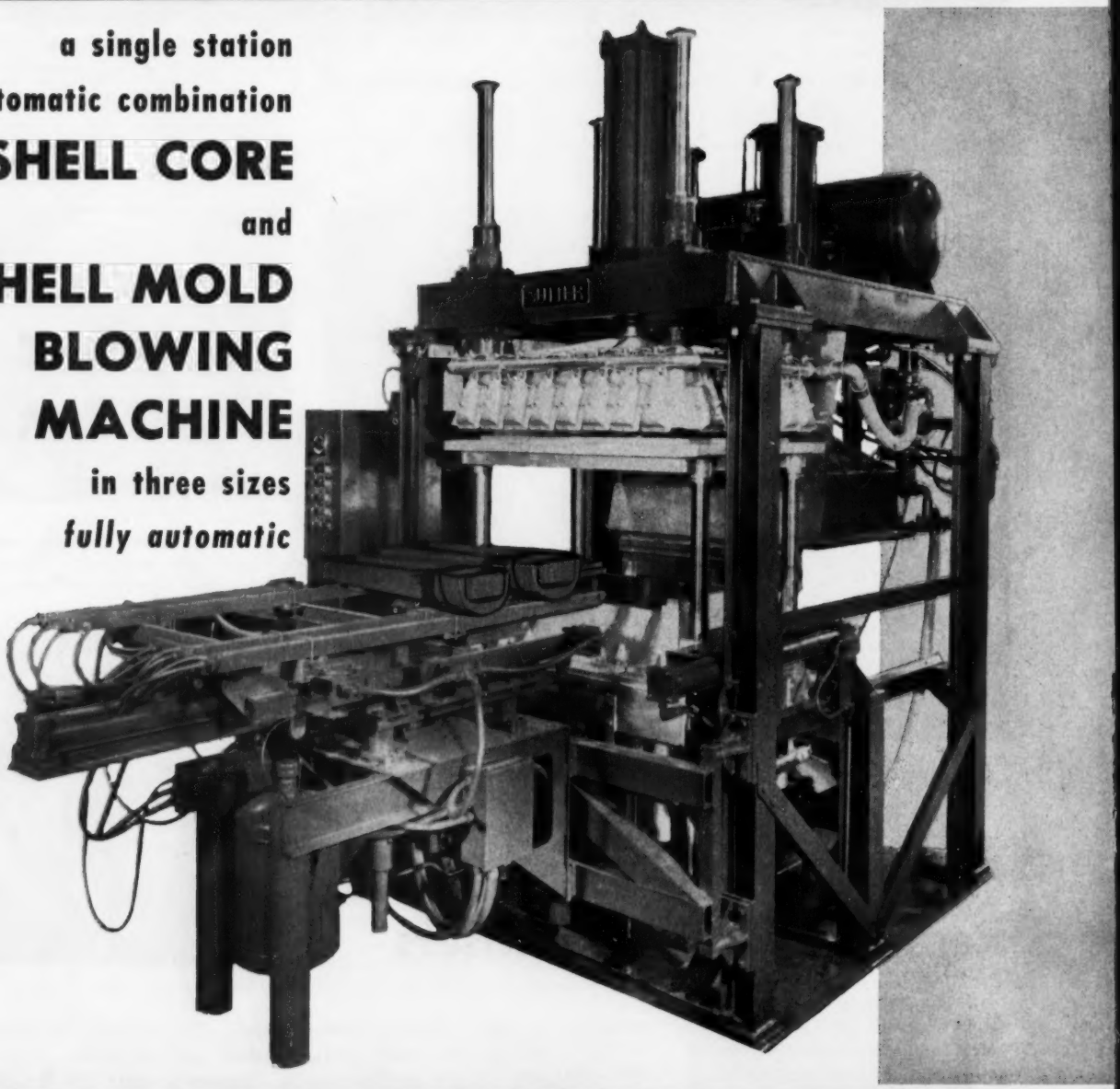
As cutting is performed, the work is rotated at 10 to 100 rpm, as the job requires. Cutting time ranges from $2\frac{1}{2}$ to 4 seconds per square inch of metal cut, depending on type of metal. The toughest of materials can be cut, and full eccentric cutting is possible because of the following action of the cutting wheel. Cut surfaces are reported to show excellent finish.

The chuck used with the 10-hp machine shown here is adjustable through 6 in., in or out. Maximum capacity for inside chucking is 8 in. Larger and smaller machines can be built for specific requirements. —**Wallace Supplies Mfg. Co.**, 1300 W. Diversey Parkway, Chicago 14, Ill.

For More Details Circle No. 484—Page 53

World's Largest Manufacturer of
Shell Mold & Core Making Equipment
Presents:

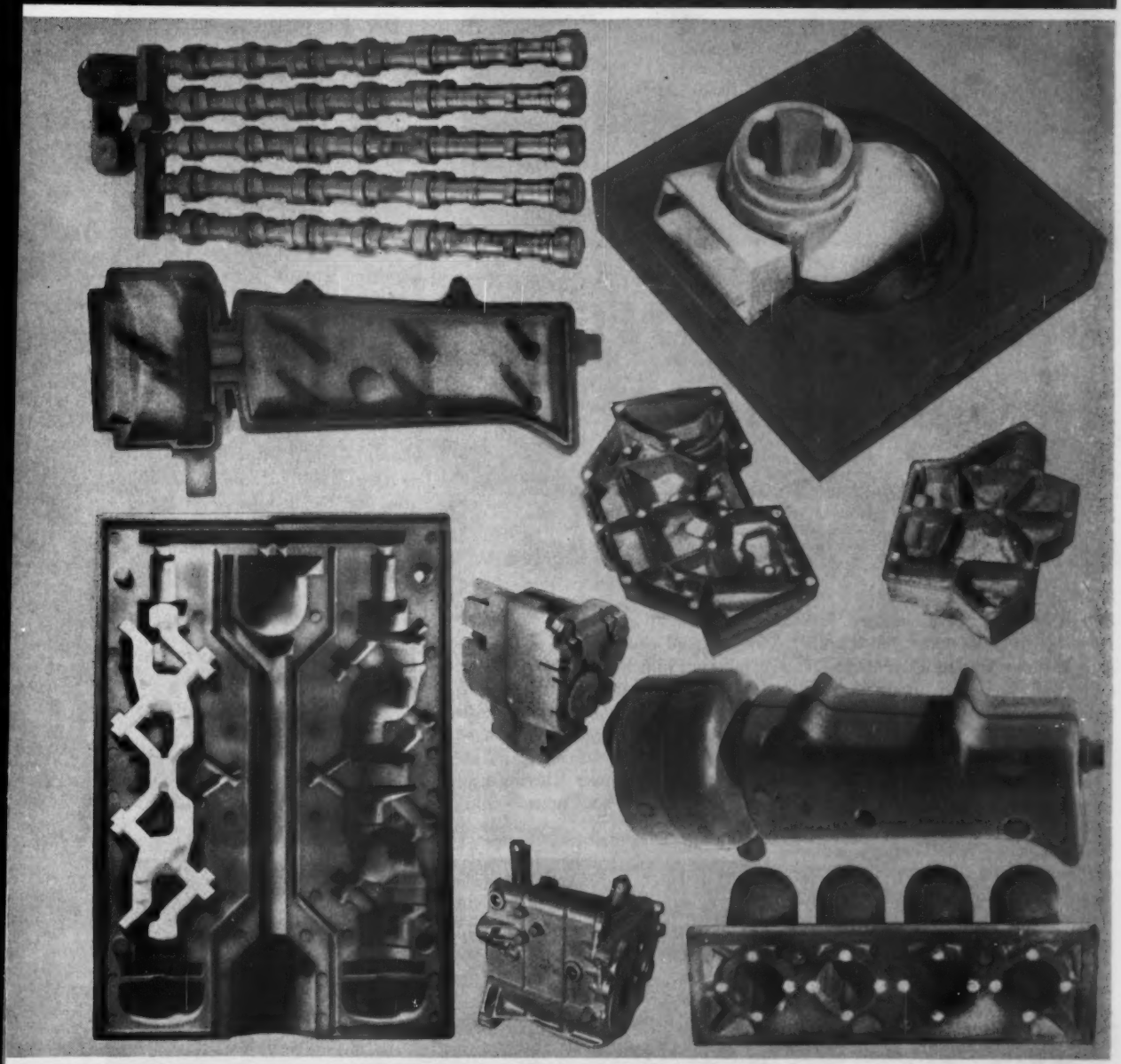
a single station
automatic combination
SHELL CORE
and
SHELL MOLD
BLOWING
MACHINE
in three sizes
fully automatic



Dedicated to the creative engineering approach in the design

WRITE FOR DETAILS TO: **SUTTER PRODUCTS**

SUTTER

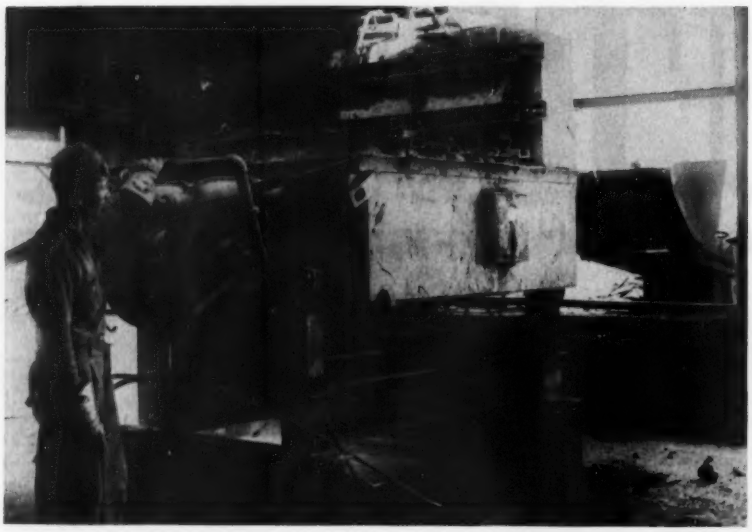


and manufacture of equipment for the metal casting industry

COMPANY

407 HADLEY STREET, HOLLY, MICHIGAN

Circle 620 on Page 53



Each furnace is fired by two premixed burners, each with input of 3000 cu ft per hr

GAS FIRING
Cuts Foundry Costs

By STEPHEN J. MICHAELS
Industrial Sales Supervisor
Bridgeport Gas Co.
Bridgeport, Conn.

● GAS-FIRED reverberatory furnace melting of metal for ductile iron castings has resulted in lower costs and increased production at Ductile Iron Foundry Inc., Stratford, Conn.

This company, which produces ductile iron castings exclusively, formerly used cupola melting. Last year, it purchased two 2000-lb per hour capacity reverberatory units made by Reda Furnace Co. Div., Reda Pump Co., Bartlesville, Okla. These furnaces were equipped with combination oil-gas burners.

Although the foundry planned to use natural gas as fuel, it was necessary to conduct oil-firing operations while the gas company extended service mains to the plant. While the mains were installed, data were gathered on costs of oil operation.

Gas operation has far exceeded the original expectations of the gas company's industrial representatives. In spite of higher straight fuel costs than with oil, total overhead costs have been cut. Large savings have been realized in the areas of refractory maintenance, alloying materials, spoilage, and housekeeping costs. Management was so well pleased with the gas operation that two pit-type heat treating furnaces and ten ladle heaters were converted to gas firing.

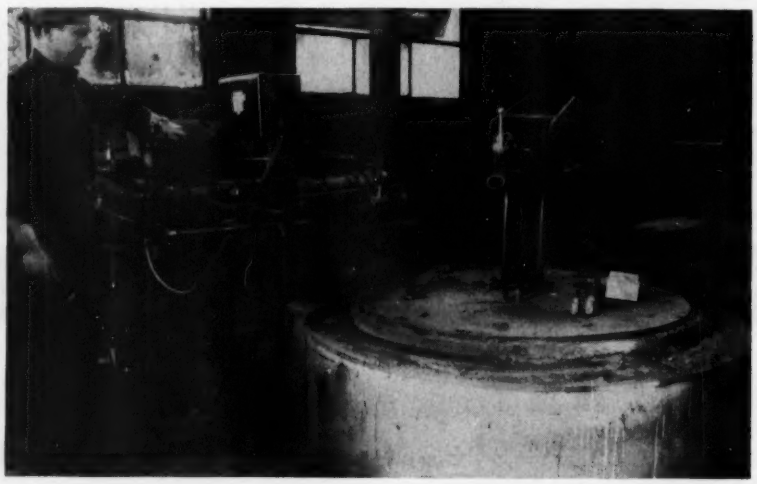
The efficiency and consistency of both the melting time and the chemical analysis of the castings have increased production 10 per cent per straight time shift. This improvement also has resulted in the foundry's being able to operate on more efficient and more economical production schedules.

As another benefit, the uniformity of the chemical analysis has been improved greatly with natural gas fuel. This uniformity is an important factor in the production of high quality nodular iron castings. In addition to its nodularizing function, the magnesium alloy also acts as a desulfurizing agent. Since natural gas has no sulfur content, the amount of this alloy added to the melt has been reduced. The reduction has resulted in monthly savings of $250.

The $735 per month in refractory cost savings shown in Table I is expected to be increased by another 25 per cent, to approximately $920 per month. This further sav-

Table I—Monthly Refractory Costs
(Based on the same melted tonnage)

	Oil	Gas	Savings
Materials	$1289	$619	$670
Labor	104	39	65
Total	$1393	$658	$735



Gas-fired pit-type convection furnace for heat treating of castings operates up to 1600°

Write for Bulletin No. 53-CM.

keep your quality in circulation

Skilled workmanship in the core room is wasted if oven heat isn't properly circulated and rigidly controlled. That's why control experts in the nation's largest foundries depend on Carl Mayer Core and Mold Ovens.

Your temper and temperature are always controlled with Carl Mayer Vertical Ovens. The heat recirculation system includes a sealed combustion chamber that keeps gases from prematurely escaping into the load area. Cores are evenly baked, and burning is eliminated.

Installation costs are sharply reduced, heat loss is minimized. For higher operating efficiency, greater production economy . . . Carl Mayer Vertical Ovens.

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THE **carl mayer** CORP.

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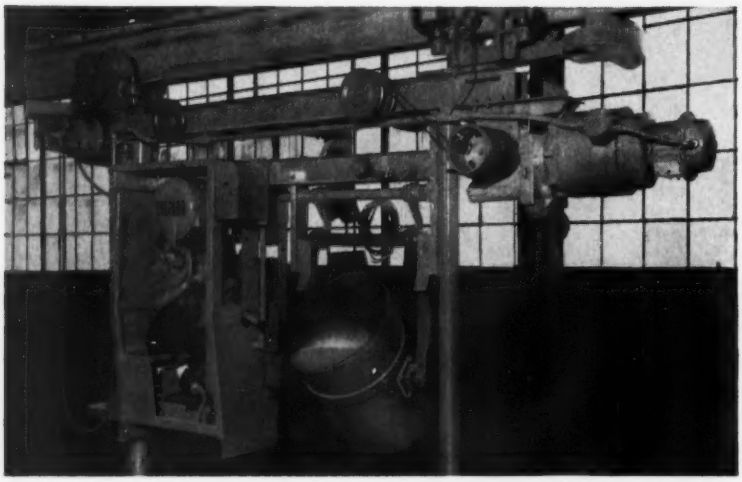
SHEPARD NILES

HOT METAL CARRIER

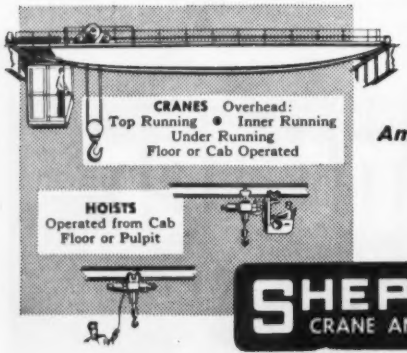
MOVE HOT METAL

the safe, swift, economical way



Shepard Niles hot metal carriers efficiently move molten metal safely and swiftly from cupola to pouring line. These rugged, modern carriers cut handling costs and save manpower by enabling ONE man to transport and pour molten metal. You can be certain of fast precision pouring because the operator cab is on the same level as the hot metal being poured.

Mechanize your foundry for labor-saving, low cost handling of molten metal. Send for the Hot Metal Carrier bulletin . . . or ask that a Shepard Niles representative call — there's NO OBLIGATION.



Building
America's Most Complete Line of Cranes and Hoists Since 1903

SHEPARD NILES
CRANE AND HOIST CORPORATION
1382 Schuyler Ave., Montour Falls, N.Y.

ing is expected because the elimination of sulfur will enable the maintenance department to use less expensive poured refractory materials and to reduce high labor costs.

Another important cost saving related to refractories has resulted in the elimination of furnace downtime during production hours. When oil was burned, each furnace had to be shut down for two hours every second day during operation for repairs caused by high refractory burnout. This maintenance necessitated two overtime melting hours and caused erratic production schedules. The conversion to gas fuel has regulated furnace repairs, which are only minor, to Saturdays and has made possible systematic and exact production schedules.

Burner maintenance costs on the reverberatory furnaces and the heat treating furnaces have been reduced. All oil burners had to be cleaned once a day, and elimination of this problem has resulted in a saving of $75 per month. The heat treating furnaces have not been touched since the day the equipment was fired with natural gas fuel, and equipment life will be increased greatly by the absence of sulfur.

The use of natural gas in the heat treating furnaces has reduced the amount of scale developed on the castings, thus lowering labor descaling costs. This benefit has resulted in a $125 monthly labor saving. A further saving of $125 a month has been realized by converting the ladle heaters to natural gas firing.

As indicated in Table II, the gas

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Circle 623 on Page 53→

SIX DIFFERENT WAYS TO LOSE A JOB

The man in the picture at left could be your neighbor . . . or could be you. Shown above him are a few of the many imported articles he and other Americans have been buying at prices substantially lower than those of domestic products in steadily rising quantities. Each sale of an imported item means a lost sale to a domestic producer: each lost sale inevitably must be reflected in lower production by domestic producers which in turn must mean fewer jobs for American workers.

The problem of imports is one the ferro-alloys industry has had to face for several years, and the reason for our concern, while based naturally enough on our lost sales, is that this trend must ultimately have a serious effect on the jobs of every American. Further, this trend could all too easily affect the strength of American industry on which our entire economy is based.

Perhaps the import problem has not yet made itself felt in your industry. It will.

QUALITY SERVICE DEPENDABILITY

Ohio Ferro-Alloys Corporation
Canton, Ohio

Birmingham, Boston, Chicago, Denver, Detroit, Houston, Kansas City, Los Angeles, Minneapolis, Philadelphia, Pittsburgh, Salt Lake City, San Francisco, Seattle, Vancouver, B.C.

operation will result in an annual saving of at least $14,640, plus many other intangible cost advantages. Gas consumption has been running 2,500 mcf per month and shortly will be doubled.

Table II—Resultant Monthly Savings

Propane fuel	$125
Refractory	920
Descaling	125
Magnesium	250
Burner maintenance	75
Total	$1495
Less fuel cost difference	275
Total monthly savings	$1220

Ductile's management plans to convert the core oven and office space heating system to natural gas fuel in the near future. It also will install additional gas-fired reverberatory furnace equipment which will double melting capacity.

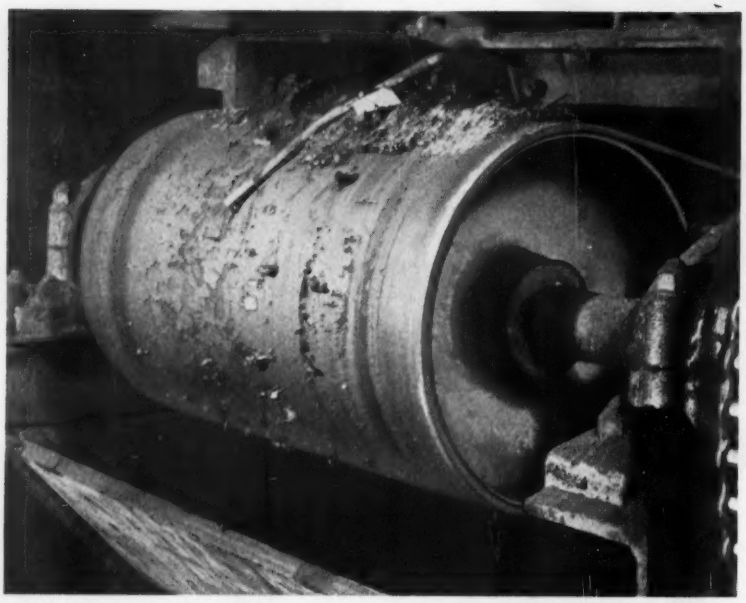
Training & Research Institute Of AFS Lists 1960 Courses

The 1960 series of training courses for foundry technicians and supervisors has been announced by the Training and Research Institute, American Foundrymen's Society.

The course names, dates, locations, and fees for remainder of the year are as follows: Gating and Risering of Castings, Feb. 3-5, Chicago, $60; Metallurgy of Ferrous Alloys, Feb. 22-24, Chicago, $60; Melting and Heat Treatment of Malleable Iron, March 7-9, Chicago, $60; Casting Design and Stress Analysis, March 28-30, Chicago, $60; Shell Molds and Cores, April 11-13, Chicago, $60; Production of Ductile Iron, June 27-29, Chicago, $60.

Blueprint Reading, Estimating, July 11-13, Chicago, $60; Welding and Brazing of Castings, Aug. 17-19, Chicago, $60; Core Practices, Aug. 29-Sept. 2, Chicago, $90; Foundry Refractories, Sept. 12-14, Chicago, $60; Economical Purchasing of Foundry Materials, Sept. 26-28, Chicago, $60; Sand Testing, Oct. 10-14, Detroit, $150; Foundry Plant Layout, Oct. 24-26, Chicago, $60; Metallurgy of Light and Copper-Base Alloys, Nov. 7-9, Chicago, $60; and Sand Control and Technology, Dec. 5-7, Detroit, $60.

For further information, contact Ralph E. Betterley, training supervisor, AFS Training and Research Institute, Golf and Wolf Roads, Des Plaines, Ill.



Stearns 12"x 24" Indox V Magnetic Pulley removes tramp iron from 105 tons of foundry sand daily at Continental Gin Company. Powerful magnetic field holds iron fragments as clean sand is discharged into skip hoist which feeds muller. A pioneer American manufacturer, Continental can trace its origins from 1836.

"NEVER ANY DOUBT"

with Stearns INDOX V Permanent Magnet Pulley

says Continental Gin Company

Continental Gin Company, Birmingham, Alabama, recently installed a Stearns Indox V permanent magnet pulley to replace an electromagnetic unit handling foundry sand. Immediate results were: (1) complete elimination of time-wasting maintenance on brushes, contacts, wiring, etc., and (2) assurance that the pulley is effective 100% of the time.

Says J. L. Hill, foundry superintendent, "Now when we use reclaimed sand, there's never any doubt. The Stearns Indox V magnetic pulley has eliminated all of the tramp iron. Power failures have no effect on pulley performance."

The new Stearns Indox V pulley is installed on a belt conveyor feeding a skip hoist to the muller. It handles 105 tons of sand daily, protects muller, sandslinger and pattern equipment from costly tramp iron damage. Estimated savings on equipment repairs are 50 percent for slinger parts and about 30 percent for mill linings. The pulley also protects foundry workers against hazards caused by iron fragments mixed with the sand.

Stearns Indox V magnetic pulleys outperform conventional permanent magnet pulleys, equal deep-field power of electromagnetic types. Radial pole design boosts holding efficiency and assures maximum tramp iron removal. Standard pulley widths and diameters to match your present conveyor system. Call your Stearns representative or write for Bulletin No. 1021G.

WHAT IS INDOX V?

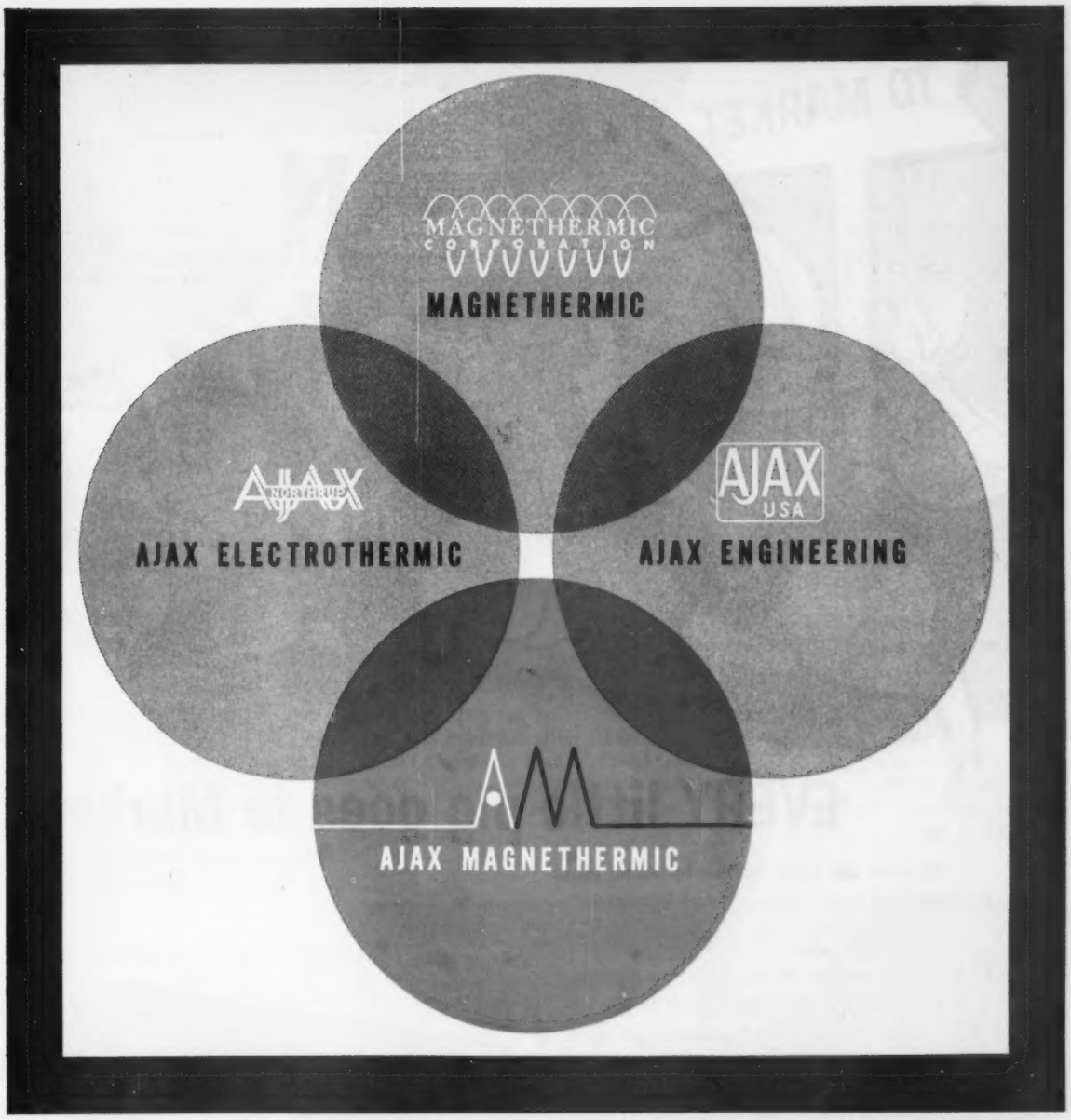
Indox V is a highly oriented barium ferrite ceramic material. Its energy is comparable, on an equivalent weight basis, to that of Alnico V — the most powerful permanent magnet material available. Indox V magnets possess unique advantages — light weight, high electrical resistivity, great resistance to demagnetization, inexpensive, non-critical raw materials — plus an energy product over three times that of non-oriented ceramic magnets. Indox V is used in magnetic pulleys manufactured by Stearns *exclusively*.

STEARNS MAGNETIC PRODUCTS

DIVISION OF INDIANA GENERAL CORPORATION • VALPARAISO, INDIANA

635 SOUTH 28TH STREET • MILWAUKEE 46, WISCONSIN

Circle 624 on Page 53



THE NEW NAME WITH THE FAMILIAR RING!

This new name combines three old names of the Induction Heating business—Ajax Engineering, pioneer in 60-cycle melting; Ajax Electrothermic, pioneer in high-frequency melting; and Magnethermic, pioneer in Induction Billet Heating.
This old "new" company now offers the most complete line of Induction Heating equipment, the most experienced staff and the largest facilities of any manufacturer of Induction Heating equipment. This combination of experience, facilities and product line permits an unbiased evaluation of your heating or melting application.

"induction heating is our only business"

Ajax Magnethermic CORPORATION

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Youngstown 1, Ohio

TRENTON DIVISION
930 Lower Ferry Road
Trenton 5, New Jersey

YOUNGSTOWN DIVISION
3990 Simon Road
Youngstown 1, Ohio

Circle 625 on Page 53

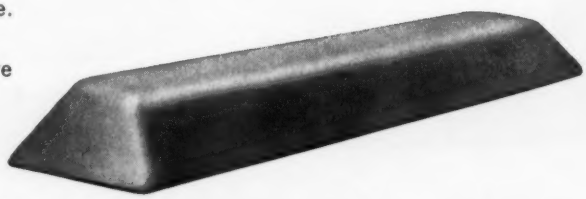
EVERY little pig goes to Market

No little pig stays home—for some other purpose. The entire production of Interlake's famous Meltrite pig iron is for sale.

This means you can always count on Meltrite. It is in dependable supply at all times ...a key reason why foundries use more Meltrite than any other merchant pig iron.

CCC*

Wherever you are, a PM & Company Metallurgist is ready to talk with you about *"Controlled Cupola Charge" and how it can help you make better profits. Let us hear from you—no obligation.



MELTRITE PIG IRON

PICKANDS MATHER & CO.

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Circle 626 on Page 53

Industry Briefs

Aluminium Ltd., Montreal, has purchased **Apex Smelting Co.**, Chicago, for nearly $12 million worth of Aluminium stock. Apex, with plants in Chicago, Cleveland, and Los Angeles, is a leading producer of aluminum foundry alloys. The company also produces zinc and magnesium alloys and silicon, the last in Springfield, Oreg., largely for its own use. No changes in personnel are contemplated.

Arwood Corp., New York, recently was formed through the merger of Arwood Precision Casting Corp., New York, and Mercast Mfg. Corp., LaVerne, Calif., and its subsidiary Alloy Precision Castings Co., Cleveland. The new corporation will operate seven major divisions: Foundries in Tilton, N. H., Groton, Conn., Brooklyn, N. Y., and Los Angeles, for conventional investment and shell castings; a foundry in LaVerne, for frozen mercury and shell castings; and a large central tool shop and research laboratory in Brooklyn, N. Y.

Smith Foundry & Machine Co., North Baltimore, Ohio, has completed a new 7000-sq-ft foundry building. It will house a new 20-ton overhead crane and 140-ft runway.

Crane Co., Chicago, will acquire the operating assets of National-U. S. Radiator Corp., Johnstown, Pa., for more than $15 million. National-U. S. will be operated as a division or subsidiary, and present management and employees will be retained. Crane also has acquired Autronic Div., Swartwout Co., Cleveland, Ohio. Present administration will be maintained at this new division.

Beloit Eastern Corp., Downington, Pa., subsidiary of Beloit Iron Works, Beloit, Wis., is adding 14,000 sq ft to provide more area for molding, cleaning, and core work. The expansion will be completed March 1. A plan to mechanize charging facilities and further mechanize sand handling equipment is scheduled for completion late in August.

Fulton Cotton Mills Inc., Atlanta, has purchased Ainsworth-Precision Castings Co., which has seven plants. The new subsidiary will operate as Precasco Corp. and will be divided into Ainsworth Mfg. Co., a supplier to the automobile industry, and Precision Castings Co. Precasco officers will include Bernard A. Mitchell, president, and Jay Levine, chairman, who is also chairman of Fulton Cotton Mills.

WaiMet Alloys Co., producer of stainless steels, tool steels, and superalloys, has moved its headquarters and manufacturing facilities to 5320 Oakman Blvd., Dearborn, Mich. The new building also will house a complete metallurgical and testing laboratory.

All Tools Inc., Denver, Colo., has been incorporated, listing $25,000 capitalization to operate a foundry and machine shop and manufacture machinery, tools, dies, parts of machinery, etc. Incorporators and directors are Percy L. Maltby, Albert Walter, and Margaret A. Kirkpatrick. Wilbur M. Pryor Jr., 1700 Broadway, is corporation agent.

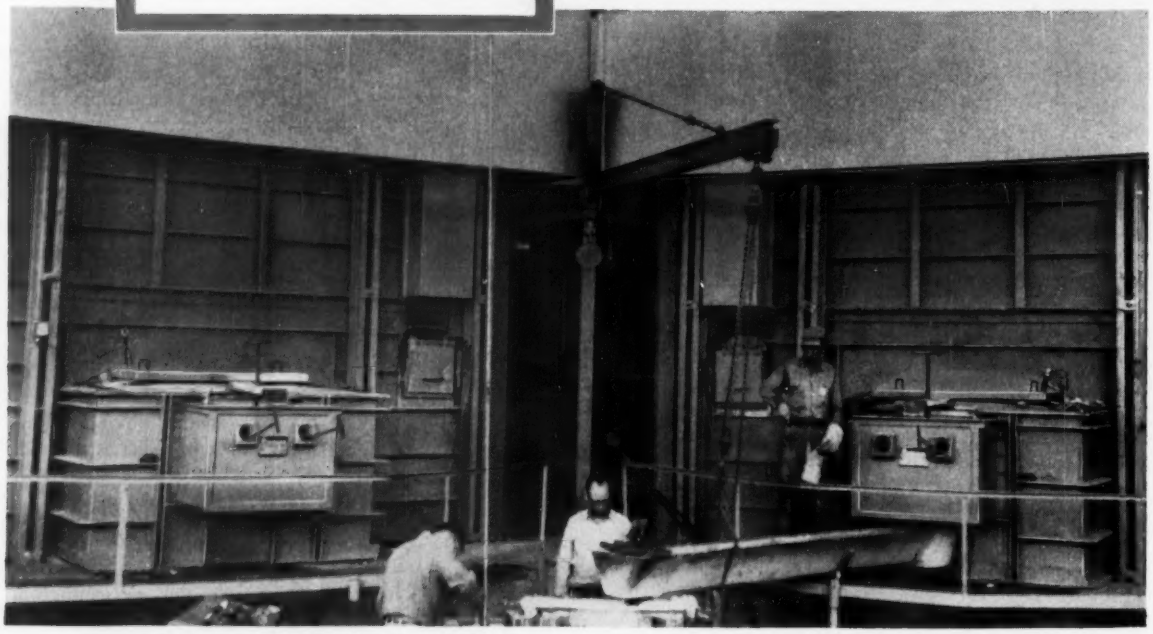
Gulf Reduction Corp., 6030 Esperson St., Houston, Tex., has been appointed ingot distributor for Kaiser Aluminum & Chemical Sales Inc. in the south central region.

General Equipment & Machine Co., 511 E. Colfax Ave., South Bend, Ind., has been named distributor for Kwik-Mix Co., Port Washington, Wis., in an eight-county area on the Indiana-Michigan border.

Picco Inc., 1729 N. Chico Ave., El Monte, Calif., investment casting producer, is adding a 5600-sq-

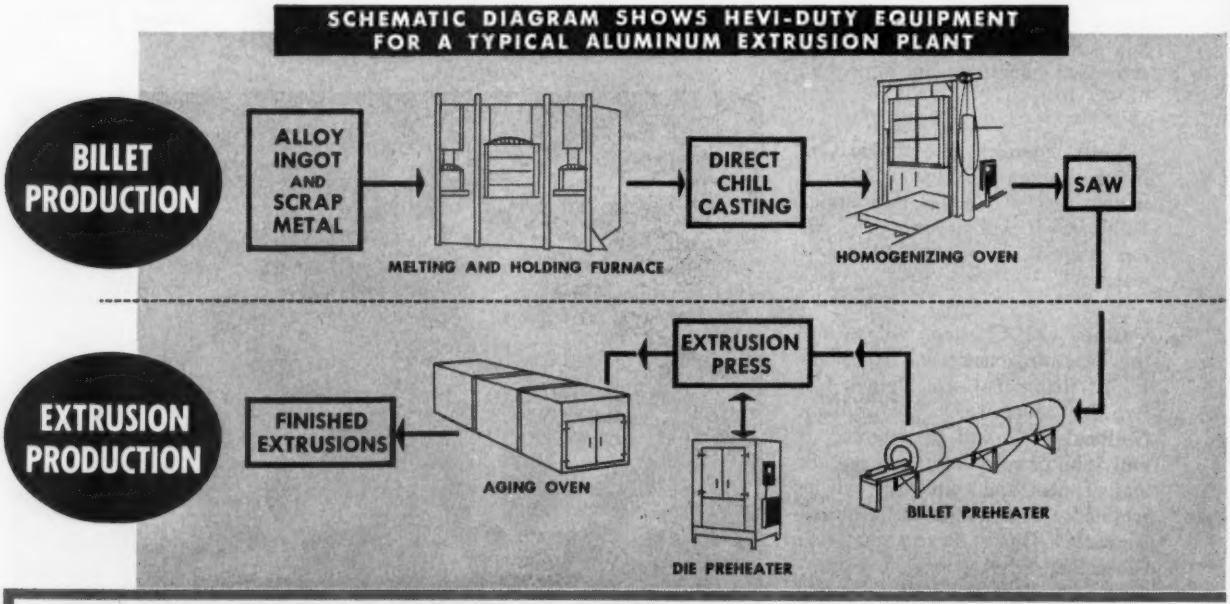
EMPLOYEE SEMINARS: To combat employees' lack of understanding of economics, Electric Steel Foundry Co., Portland, Oreg., has introduced a series of employee seminars on the American competitive enterprise economy. Study materials consist of 17 pamphlets provided by the U. S. Chamber of Commerce and the Oregon Effective Citizens League. The program is expected to include most of the firm's employees eventually. In the view above, the moderator, standing, is Bill Walkins, editor of the company magazine.

HEVI-DUTY your prime source for

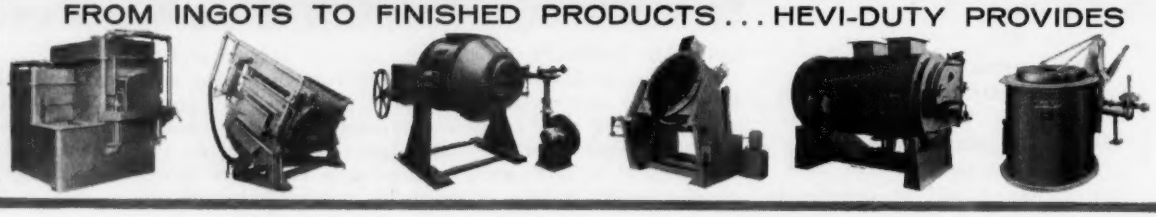


MELTING AND HOLDING FURNACE—*These Hevi-Duty reverberatory furnaces provide maximum efficiencies for melting and holding aluminum. Available in capacities to 60,000 pounds, this type of furnace can be used for smelting, billet casting, die casting, permanent mold work, and other foundry melting.*

SCHEMATIC DIAGRAM SHOWS HEVI-DUTY EQUIPMENT FOR A TYPICAL ALUMINUM EXTRUSION PLANT



FROM INGOTS TO FINISHED PRODUCTS . . . HEVI-DUTY PROVIDES



quality furnaces and ovens for aluminum

Melting, holding, and heat-treating furnaces . . . billet preheaters, homogenizing and aging ovens . . . engineered to meet your production requirements.

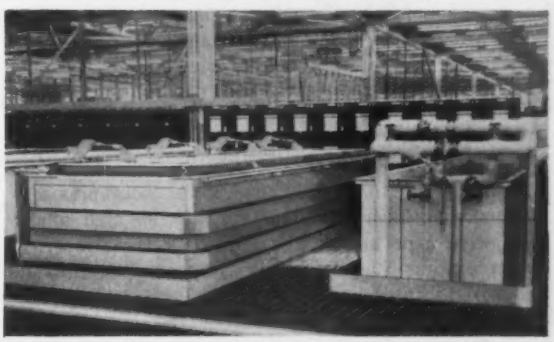
Whatever your heating requirements for processing aluminum, you can depend on Hevi-Duty standard and specially-engineered furnaces and ovens to do the job efficiently and economically. Throughout the aluminum industry, Hevi-Duty equipment serves in practically every phase of heat-treatment and melting.

For example: In a typical aluminum extrusion plant, as illustrated in the schematic diagram, Hevi-Duty equipment plays a major role. Fuel-fired reverberatory furnaces provide fast, controlled heat for melting and holding metal for billet casting. Hevi-Duty homogenizing ovens, either fuel-fired or electrically heated, assure high quality aluminum billets. Hevi-Duty preheat ovens are used to heat the billets in preparation for extruding. Hevi-Duty tray type ovens are used to preheat extrusion dies. Aging of the extruded aluminum shapes is accomplished in Hevi-Duty ovens at temperatures to 400° F.

What's more, Hevi-Duty offers a complete range of electric and fuel-fired heat-treating furnaces for rapid solution treatment and aging of aluminum and aluminum alloys at elevated temperatures.

The application of heat to aluminum is a specialty at Hevi-Duty. Our engineers can help you boost your product output at lower cost. Contact Hevi-Duty first for *all* furnaces and ovens required for processing aluminum.

HOMOGENIZING OVEN—*Homogenizing of aluminum logs is accomplished in this Hevi-Duty car-bottom oven at temperatures of approximately 1000° F. Finished extrusions consequently have superior physical properties.*



SOLUTION TREATMENT AND AGING—*Typical Hevi-Duty immersed electrode salt bath furnace used for solution heat-treating of large aluminum aircraft sections. Furnace illustrated has a pot 20 feet long, 4½ feet wide, and 6 feet deep.*

ASK HEVI-DUTY

For more information on the complete range of furnaces and ovens for aluminum processing, write for bulletins 653, 591, and 159.

HEVI-DUTY

A DIVISION OF BPC BASIC PRODUCTS CORPORATION

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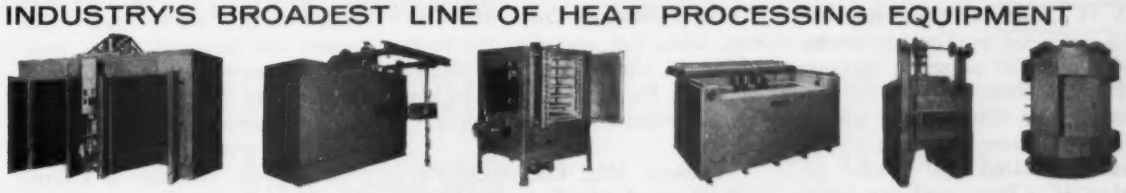

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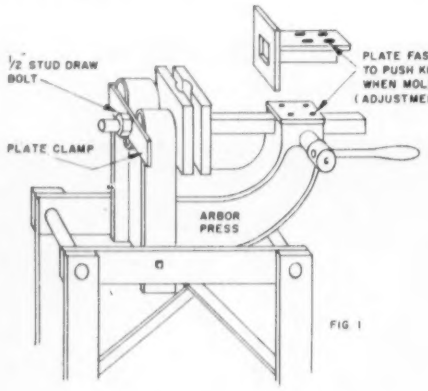

½" STUD DRAW BOLT
PLATE FASTENED OVER RAM TO PUSH KNOCK-OUT PINS WHEN MOLD IS OPENED (ADJUSTMENT ON FRAME 1")
PLATE CLAMP
ARBOR PRESS

FIG. 1

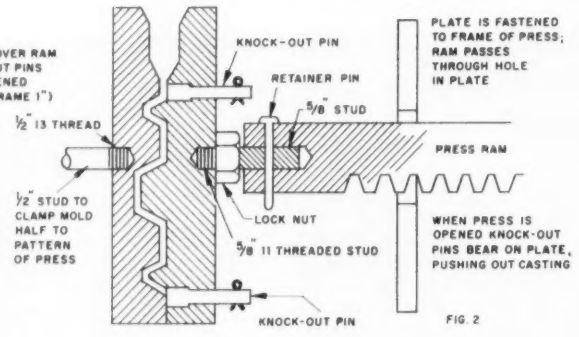

KNOCK-OUT PIN
RETAINER PIN
PLATE IS FASTENED TO FRAME OF PRESS; RAM PASSES THROUGH HOLE IN PLATE
⅝" STUD
½" 13 THREAD
PRESS RAM
½" STUD TO CLAMP MOLD HALF TO PATTERN OF PRESS
LOCK NUT
⅝" 11 THREADED STUD
WHEN PRESS IS OPENED KNOCK-OUT PINS BEAR ON PLATE, PUSHING OUT CASTING
KNOCK-OUT PIN

FIG. 2

Uses Arbor Press as Closing Device For Permanent Molds

By A. F. WYLIE
Manhattan Aluminum Castings
Manhattan, Kans.

AN ARBOR press can be used to open and close permanent molds during castings production. Fig. 1 shows the application. Half of a mold is mounted rigidly to the base of the press with a ½-in. draw bolt and steel plate clamping device. The other half of the mold is attached to the press ram by a ⅝-in. threaded stud. Details are shown in Fig. 2.

Conventional, machined gray iron molds with tapered dowel pins and mating holes to assure proper alignment are used. Knockout pins also may be incorporated in the movable half of the permanent mold to loosen the casting for easy removal. When the mold is opened, the protruding ends of these pins contact a steel plate and loosen the casting as the mold half is moved farther back. The plate is mounted to the press frame and has a hole in the center to permit free movement of the ram.

Use of molds designed for easy interchangeability on a common mold-closing device, such as this press, saves storage space. Because each set of molds is not constructed with its own closing device, the molds may be stored on shelves like books.

The author has produced aluminum castings at the rate of 120 an hour on the mold-closing device described here.

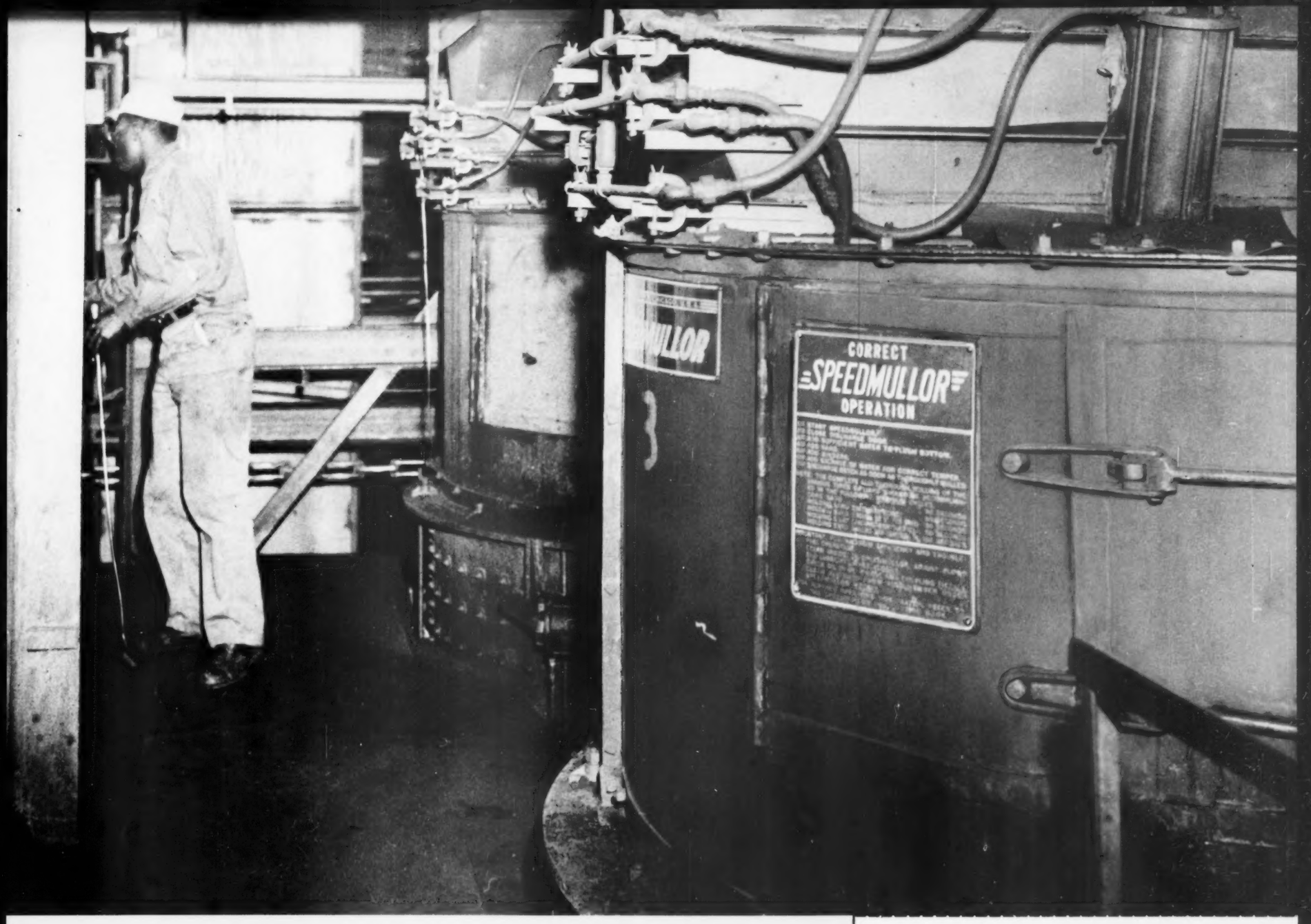
ft building to its present site. The additional area will house the powdered metal department which will be moved from its present location in Sierra Madre, Calif. It also will house an engineering department and assembly operations as required.

A. H. Climo Co., Cleveland, has been purchased by Tousey Varnish Co. Tousey has plants in Chicago and East Moline, Ill., and will operate A. H. Climo as a wholly owned subsidiary. Climo Co. was founded in 1903 and headed by Arthur H. Climo until his death in 1958. The general industrial finish line produced by Climo will be continued and expanded. New officers are Carl R. Heagstedt, president; Bradford W. Alcorn, executive vice president; Edward J. Masterson, vice president and treasurer; and Harry D. Wright, secretary.

Cooper-Bessemer Corp., Mt. Vernon, Ohio, has opened a new field office, 431 Union Trust Bldg., Pittsburgh 19, Pa. J. M. Brannaman has been appointed branch manager.

Hardinge Mfg. Co., York, Pa., subsidiary of Hardinge Co. Inc., will spend $300,000 to expand and modernize its foundry facilities. Approximately 32,000 sq ft of floor space will be provided in the enlarged foundry.

Aelco Foundries Inc., Milwaukee, has been sold to two of the former owners by the group which purchased control last February. New owners are Edgar W. Loke, president and treasurer, and Joseph N. Roman, vice president in charge of foundry operations. A. F. Lauersdorf, who was president until last February, has returned as a director of the firm.



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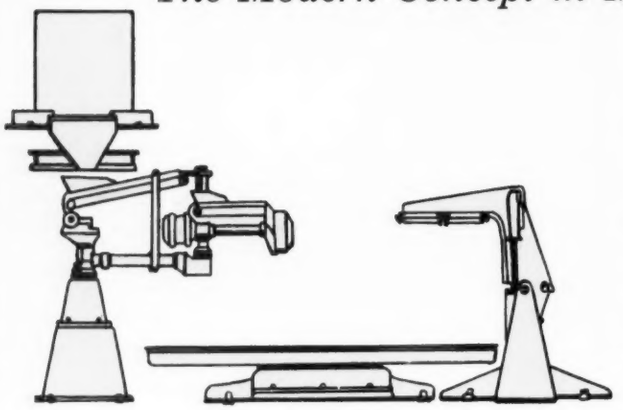

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Hydra-Mold installations in progressive foundries are described in recent issues of BETTER METHODS. Write directly to B&P for your free copies.

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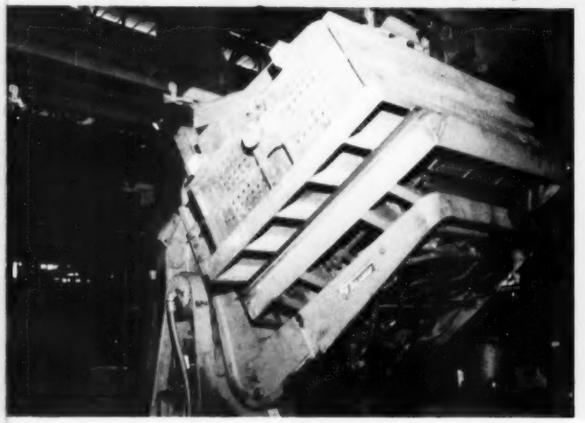

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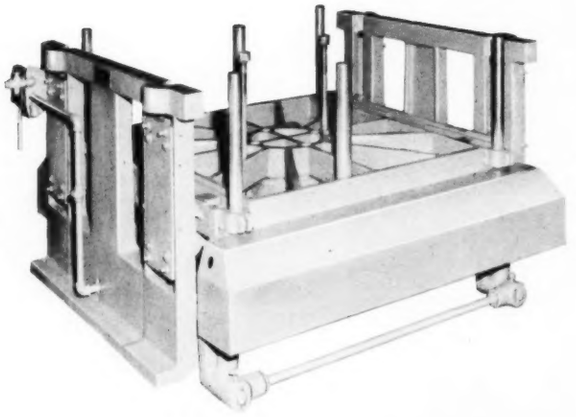

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Convention Hall, Philadelphia, will be the site of the 1960 Castings Congress and Exposition of the American Foundrymen's Society

AFS EXPOSITION WILL SHOW NEW PRODUCTS

Sellout of Available Space Is Predicted

● NEARLY 85 per cent of the available space for the 1960 Castings Congress and Exposition of the American Foundrymen's Society is under contract, society officials report. The exposition will be held May 9-13 in Convention Hall, Philadelphia.

All 1960 daytime technical sessions also will meet in Convention Hall. Sessions include symposiums, eight off-the-record roundtables, and sand, malleable, gray iron, and ductile iron shop courses.

Virtually every line of foundry equipment, materials, and supplies is said to be represented, some by many companies. Exhibitors include 23 material handling equipment firms; 32 manufacturers of melting furnaces and auxiliary equipment; 75 producers of molding and coremaking equipment, tools, and materials; 9 manufacturers of laboratory and testing equipment; 15 refractories producers; 22 makers of shakeout and cleaning equipment; 22 producers of metals and alloys; 10 manufacturers of patternmaking equipment; and many others. All exhibit space is expected to be sold in advance of opening day.

AFS also states that an unusually high percentage of exhibitors at the 1960 exposition intend to display products never before demonstrated. Among the many new developments to be shown next May will be broader use of electronics for controls and automated operations; new quality control testing methods; improvements in x-ray and other nondestructive testing methods; a completely automated molding-pouring-shakeout system; improved means of dust and fume control, shop ventilation, and air pollution control; new noise-absorption materials; built-in safety devices; new types of material handling equipment; speedier, more selective sand distribution systems; and a broad array of new and improved materials for dry and green sand molding, coremaking, shell molding, and patternmaking.

In addition, actual foundry operations—both ferrous and nonferrous—will be shown. One exhibitor is reported to be developing a complete working foundry which will demonstrate sand mixing, molding, pouring, shakeout, and cleaning. Another firm will present a mobile laboratory. All told, nearly 300 firms will exhibit their products and services.

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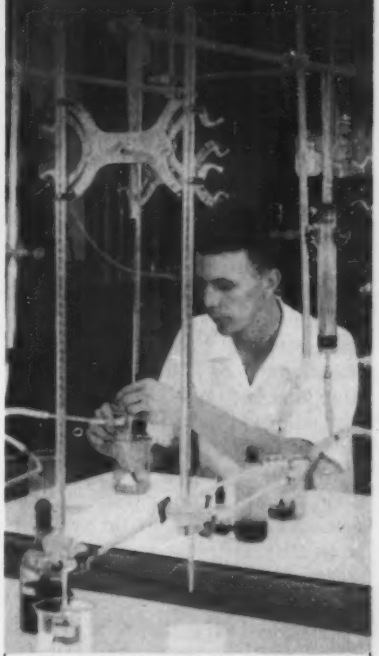

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Foundry Developments

By EDWIN BREMER

Metallurgical Editor

Inner Space Studies

STRONGER alloys designed to more exact specifications may result from research reported in the November, 1959 issue of *Battelle Technical Review*. New findings on strength of experimental aluminum-copper alloys described by Dr. Ervin E. Underwood may have application to more complex alloys.

Most important factor in strengthening high-temperature, high-strength alloys usually is the fine metallic particles dispersed throughout the alloys. Until recently it was assumed that the closer the particle spacing, the greater the strengthening, and vice versa. Investigations at Battelle disclosed that although wider spacing means decreased strength, this trend reverses itself at a certain point. When spacing is increased to that critical point the strength begins to increase, reaches a peak with further spacing, and again declines.

For spherical particles in the alloys studied, a maximum strength increase of 16,000 psi was found with a spacing of about 0.003 in. For platelike particles the peak reaches 23,000 psi at about 0.0006 in. spacing. With greater spacing in both cases the strength begins to decline.

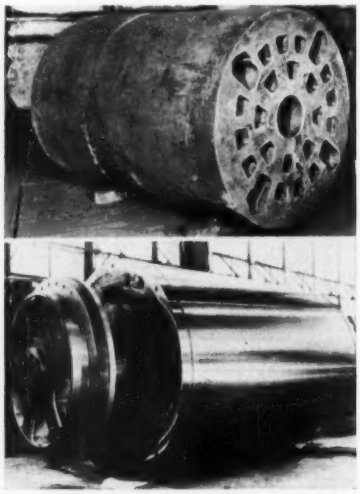
Sand for CO_2 Process

CONSIDERING certain disadvantages of the CO_2 process in mold production, particularly the low green strength in machine molding, a British firm, Glacier Metal Co. Ltd., experimented to determine whether a suitable sand could be developed. It obtained successful results. Some details of the work are presented in an article, "Development of a Co_2-Process Moulding Sand," by H. T. Bidwell in the Oct. 29, 1959 issue of *Foundry Trade Journal* (London, England).

Although exact details are not given—it is said that the process is subject to a patent application—indications are that the sand is a mixture of 60 per cent silica sand, 40 per cent natural sand with a small addition of clay. It is milled thoroughly with a small amount of sodium carbonate to satisfy the base-exchange reaction, and then 3½ per cent sodium silicate is added. It is reported that the sand was in good condition after six days.

Big Press Cylinder

HUGE ductile iron casting shown in the accompanying illustrations will form the impression cylinder in a large four-color printing press being made by Goss Co. Div., Miehle-Goss-Dexter Inc., Chicago, for printing millions of copies of national magazines. One of the



largest cylinder castings ever made of ductile iron by Advance Foundry Co., Dayton, O., it weighs 32,420 lb, and is 60 in. in diam and 88 in. long. Upper illustration shows the cylinder in the as-cast state and the lower one shows it after machining and subassembly.

Nodular Piston Rings

INVESTIGATION on application of nodular iron for piston rings is described in an article, "Nodular-cast-iron Piston Rings with a Ferritic Matrix", by Traian Dumitrescu and Pascal Popescu in the Oct. 15, 1959, issue of *Foundry Trade Journal* (London, England). Silicon content of the iron varied between 3.80 and 5.22 per cent. Metal was cast centrifugally into piston ring pots 137 mm ID, 170 to 180 mm OD, and 240 mm long.

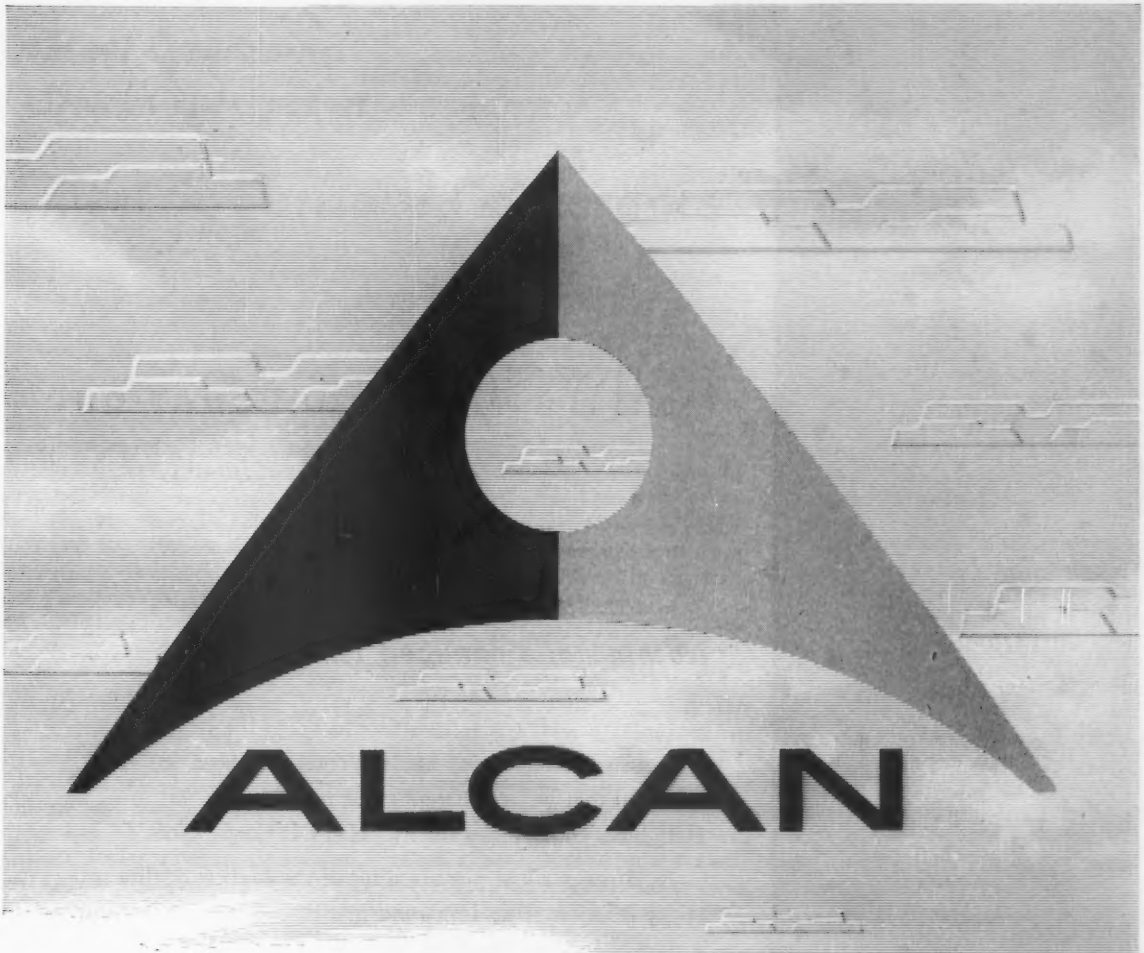
Some of the pots were heat treated at 850° C for 3 hours and furnace cooled. Others, in which a pearlitic structure was desired, were air cooled after casting. However, they were too hard, and were annealed for 1 hour at 700° C, followed by air cooling. Pot castings were turned into rings 160 mm in diam, and tested in a 12-cylinder, 2000-hp, water-cooled aeroplane engine. The cylinders were fitted with ferritic and pearlitic nodular rings as well as the usual alloy iron rings for comparison.

It was found that the ferritic rings had no internal stress but the pearlitic nodular and alloy iron rings did. The ferritic rings maintained their physical and mechanical properties at high temperature to a much greater extent than the other types. Wear resistance of the rings is superior and the wear on the cylinders is less than in the case of the other materials.

Cast Crankshaft

NEW V-6 engine developed by the Truck & Coach Div., General Motors Corp., for its 1960 trucks will incorporate a cast pearlitic malleable crankshaft. The crankshaft material is termed ArmaSteel, and the cast crankshafts will be produced at the Danville, Ill., plant of Central Foundry Div.

James H. Smith, general manager of Central Foundry, stated that the decision of Truck & Coach to use its cast crankshaft confirms the conviction that they are equal to the task in every respect while offering important savings over their forged counterparts. The truck crankshafts weigh 98 lb compared with 68 lb for a similar type cast crankshaft used in the V-8 engine of the Pontiac passenger car.



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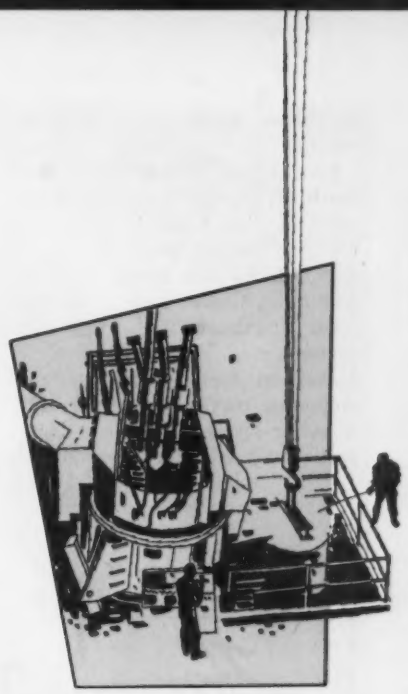
Steel Degassing Draws Interest at

Electric Furnace Conference



By EDWIN BREMER
Metallurgical Editor

● SEVENTEENTH annual Electric Steel Conference, sponsored by the Electric Furnace Committee, Iron and Steel Division, American Institute of Mining, Metallurgical and Petroleum Engineers, was held at the Sheraton-Cleveland Hotel, Cleveland, Dec. 2-4.

The meeting included one joint technical session, five sessions on ingot practice, three on ferroalloys and calcium carbide, and three on furnace practice for steel castings. The annual dinner on Thursday night had William E. Umstattd, Timken Roller Bearing Co., Canton, O., as the speaker.

New officers of the committee which will direct the next conference, to be held at the Morrison Hotel, Chicago, next Nov. 30 to Dec. 2, include G. C. Olson, Atlas Steel Ltd., Welland, Ont., chairman; C. G. Mickelson, American Steel Foundries, East Chicago, Ind., first vice chairman, and Frank St. Vincent, Globe Metallurgical Corp., Beverly, O., second vice chairman. Paul R. Gouwens, Armour Research Foundation, Chicago, who was chairman of the 1959 conference committee, was elected chairman of the Electric Furnace Executive Committee.

Opening joint session related to consumable electrode melting. Prof. W. J. Childs, Rensselaer Polytechnic Institute, Troy, N. Y., in discussing **European Developments** stated that there is increased interest in this subject in Europe, particularly in West Germany, although in general the consumable electrode furnaces are small. One of the largest installations is a 6-ton unit at the Bofors Co. in Sweden used for production of steel. Professor Childs described some of the features of an installation at Imperial Chemical Industries in England which primarily is engaged with the reactive metals Ti, Cb, Hf, Zr, etc., for nuclear applications.

R. P. Morgan, Union Carbide Metals Co., Niagara Falls, N. Y., presented a paper co-authored by T. E. Butler of the same firm on **Electrical Behavior of Consumable Electrode AC Arcs in Variable Pressure Systems.** It described how vacuum creates arc instabilities and difficulties in heat input. The variations in arc instability are hard to determine by sight, due to furnace arrangement, or by the usual electrical instrumentation. Experiments with oscilloscopic equipment, previously tried with investigations in arc welding, however, provided oscillographs which indicated the different types of arc conditions. The authors believe that when sufficient data have been accumulated, the oscilloscope can be used for control, and with development of suitable electronic equipment, the control can be made automatic.

New Developments in the Consumable Electrode Melting of Reactive Metals, by S. J. Noesen, General Electric Co., Schenectady, N. Y., pointed out that in this field there is a definite relationship between the electrode diameter, crucible size, and vacuum. The electrode should not be too small in relation to the crucible diameter so that the molten spot remains comparatively flat. Melting should be maintained near the top of the crucible by progressively lowering the ingot formed. A colored motion picture presented by E. W. Johnson, Westinghouse Electric Corp., Pittsburgh, depicted different types of arc activity in melting discs of metal under vacuum.

Consumable Electrode Melting of Steels and High-temperature Alloys by A. M. Aksoy and R. C. Buehl, Crucible Steel Co. of America, Midland, Pa., and presented by Mr. Buehl, showed that this method of melting provides ingots with low centerline porosity, low gas content, and lower inclusion count. Steels and alloys produced showed better properties at high-strength levels.

First technical session on steel castings dealt with quality control of electric furnace melting. **Effect of Various Deoxidizers on Cast Steel,** by C. E. Sims, Battelle Memorial Institute, Columbus, O., and C. W. Briggs, Steel Founders' Society of America, Cleveland, was presented by Mr. Sims. It described in detail the reactions of the various commonly used deoxidizing materials.

Results obtained by separate additions of various materials is the same as when added in the form of a complex alloy. However, the latter permits formulation where one agent protects another, and thus obtains higher recovery, and also allows use of more dilute elements, giving higher yields and efficiencies. Good results have been obtained with a complex deoxidizer formed of

aluminum, misch metal and zirconium.

Joint Effect of Sulfur and Rare Earth Metals on Mechanical Properties of Cast Complex Low-alloy Electric Furnace Steel by R. D. Engquist, Hughes Research & Development, Culver City, Calif. Rare earth treatment of ultra-high strength steel has a beneficial influence on ductility and toughness properties, particularly at the higher sulfur levels. Treatment is not particularly effective in combating deleterious effects of temper embrittlement, although it offers improvement of properties at low tempering temperatures and a rather profound improvement at the higher tempering temperatures.

Melting Practice To Produce Extra Low-sulfur Carbon Steel by A. J. Kiesler, General Electric Co., Schenectady, N. Y. Excellent results are obtained in a 1-ton basic furnace by melting down and removing the slag. Then a slag former composed of 2 parts lime, 1 part silicon, 1 part graphite, and 1 lb aluminum per ton of steel is added and stirred in well. In 8 to 9 minutes the sulfur is reduced from 0.03 to 0.002-0.003 per cent. After 12 minutes the slag is removed, the bath blown for 2 minutes with oxygen, and the steel tapped at 2925° F.

Another session devoted to degassing of steels for foundry melting practice consisted of four papers. **Gas Solubility of Iron and Nickel-base Alloys,** by F. W. Boulger, Battelle Memorial Institute, Columbus, O., and Max Trziak, International Business Machines Co., Binghamton, N. Y., was presented by the latter. Solubility of H in molten Fe and Ni is about twice that in the solid state, and presence of Si reduces the solubility. Ni reduces solubility of N in ferrous alloys. In Fe the content of H is about 0.0026 per cent, O about 0.21 per cent and N around 0.042 per cent. In Ni the content of H is about 0.0039 per cent, O around 0.13 per cent, and N approximately 0.001 per cent.

Ladle to Ladle Stream Degassing for Steel Castings, by Edward Dyble and G. E. Danner, Erie Forge & Steel Corp., Erie, Pa., was presented by Mr. Dyble. Degassing method employed consists of pouring steel tapped from furnace into a small 15-ton pony, stoppered ladle assembled on the top of a 17-ft-diam, 28-ft-high chamber containing another ladle or ingot mold, as the case may be. Prior to pouring, the chamber is evacuated to 200 to 300 microns. With one heat two cast steel rings 74.875 in. OD, 63.5 in. ID, and 23 in. high were air-poured from the degassed steel into a dry-sand mold. Test bars separately cast and taken from a 4-in.-thick section of the rings showed excellent properties.

Vacuum Degassing of Steels for Aircraft Use by J. K. Dietz, Martin Co., Denver, discussed development of a low-cost system for degassing steel. It consists of a high-frequency electric furnace, a steel bell jar or chamber, and vacuum pumping equipment. Although at present a vacuum of only 600 microns has been attained, it is believed that minor modifications will permit reaching a vacuum of 20 to 30 microns.

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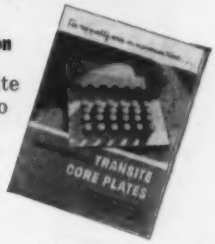
For toughness and durability, these smoothly sanded boards are fabricated of fibrous asbestos and cement in a special Johns-Manville process. Extremely strong and lightweight, they resist shock and corrosion, will not crack or break under normal use. Boards can be easily cleaned, too.

Transite Core Plates have proved themselves in hundreds of ferrous and non-ferrous foundries all over the country. They maintain their smooth, level surface year after year with a minimum of warpage and wear.

FREE new folder gives complete information

Whether or not you now use Transite Core Plates, there are many gains to be had from a careful study of our new folder IN-219A. It gives complete specification data—weights, sizes, thicknesses. *Send the coupon below.*



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Johns-Manville, Box 14, New York 16, N. Y.
(In Canada, Port Credit, Ontario)
Please send me booklet IN-219A at no cost or obligation to me.

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Firm_____

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City_____ Zone____ State_____

Circle 633 on Page 53

Here he is folks . . . *Chief Keokuk*, favorite son of steel men and foundry-men everywhere, and he wants *your* vote! His platform: Kemco Silvery . . . *the superior form of silicon introduction.* He promises: Uniformity and Economy. When you think of silicon, *think* . . . and vote for Kemco!*

KEMCO SILVERY PIG IRON

SILICON METAL—OTHER FERROALLOYS

Elect to use Kemco now! It holds silicon loss to a minimum and you can handle it by magnet or count. Your choice of 60 lb. or 30 lb. pigs or 12½ lb. piglets . . . in regular or alloy analysis. Read Kemco's "Performance Platform" in free booklet, "For Lower Costs, Higher Quality Products." Send for your copy now.

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Please send your votes to Campaign Managers Princess Wenatchee or Chief Keokuk, Jr.

stainless steel and Ni-base and Co-base alloys have been degassed successfully. It was found that a carbon boil in stainless steels can be generated under vacuum. Also castings made with degassed steel had substantially improved surface finishes.

The session closed with a paper on **Equipment Used in Vacuum Degassing in the Foundry** by W. F. Hipple, Ajax Magnethermic Corp., Trenton, N. J.

Concluding session on steel castings was devoted to pouring, refractories, gadgets, and tricks. G. J. Grott, WaiMet Alloys Co., Dearborn, Mich., discussed **Phosphate-bonded Refractories for Pouring Ladle Spouts.** Interest in these materials came about through difficulties encountered with metal and oxide streamers or drips forming on the ladle spouts when pouring certain types of alloys. When those were removed, the spout lips cracked, broke, or deformed. Refractoriness was not the problem, which was to provide a smooth surface resistant to wetting and penetration.

One mixture poured into a plaster mold to form a lip insert which gave good results was composed of 6 parts by weight of tabular alumina, 60 mesh to fines; 2.8 parts tabular alumina, minus 325 mesh; 0.2 parts calcium-aluminate cement, and 1 part phosphoric acid, 85 per cent with sufficient water for proper consistency, usually about 9 per cent. After setting overnight, the cast was removed from the mold, dried at 250° F, and brought slowly to 750° F and held for 4 hours. Then the lip was placed in the spout and rammed in position with regular ladle mix.

Success with the material led to applications for pouring cups, splash basins, inserts in molds and cores, as well as for small internal cores where erosion and penetration is a problem, and for molds where surface smoothness is a requisite. Since zircon sand is less expensive than tabular alumina, a suitable mixture is composed of 8 to 9 parts by weight of zircon sand, 1.5 to 0.75 parts calcium-aluminate cement, and 0.5 to 0.25 parts phosphoric acid with 4 to 12 per cent water depending on amount of bond and consistency desired. Shapes 1 in. thick are

HINES chrome-plated PINS AND BUSHINGS

These extremely accurate, uniform pins and bushings, plus their micrometer controlled installation on HINES flasks, provide long, uninterrupted production and fast, smooth pattern draw.

One of many HINES developments contributing to better foundry production

HINES pins are hard-chrome-plated and ground — bushings are case-hardened, hard-chrome-plated and ground.

Tolerances are extremely close, yet there is but little friction between pin and bushing. They draw without chattering, without sticking and without requiring lubrication.

HINES pins and bushings will not rust — flasks are ready for use no matter how long they've been stored.

HINES flasks are machined for pins and bushings in a micrometer-adjusted jig, to guarantee perfect alignment of cope and drag.

Flasks can be equipped to your exact requirements — single or double pins, round, hex or "V" type — with adjustable slides or bushings.

HINES designed and manufactured the *first* hard-chrome-plated and ground pins and bushings over 30 years ago and has been producing them ever since. Hundreds of thousands sold during that time are still giving good service.

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HINES FLASKS

MIXALL gives AUTO SPECIALTIES Mfg. Co. up to 6,000 lbs. of Coated Sand per hour— at lower costs than ever before!

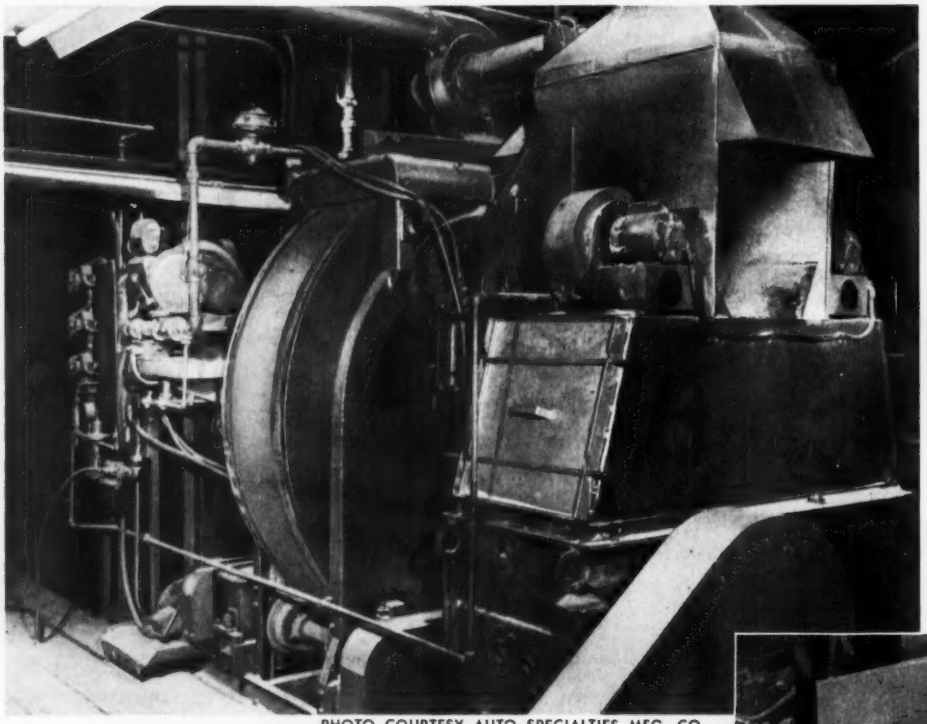


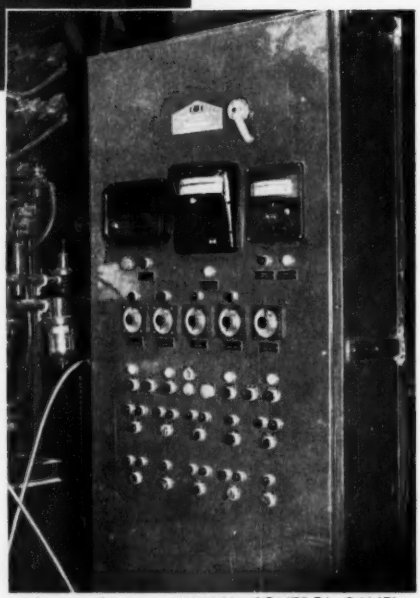
PHOTO COURTESY AUTO SPECIALTIES MFG. CO.

At left, the new Model 890 MIXALL in operation at Auto Specialties Mfg. Co., St. Joseph, Michigan. Other models also available.

In the production of castings for the automotive industry, Auto Specialties Manufacturing Co. has found that the MIXALL delivers greater batch capacity to meet its growing needs while keeping production costs down. This is accomplished by a rapid operating cycle: charging, heating, mixing, and discharging are completed in just *5 minutes.* Simultaneous heating and mixing are possible because both cycles are independently controlled. To meet today's growing competition, this kind of practical mechanization is often the solution. Perhaps your organization can profit from the many advantages offered by the MIXALL. Our experienced engineers will be happy to discuss *your* foundry problems and put you on the road to practical mechanization at the lowest cost possible. Write, call or wire.

"Constant Quality through Constant Control"

Write today for Bulletin CS-806



Above, the new MIXALL CONTROL PANEL puts complete automation and mechanization at your fingertips. Controls are conveniently located, easy to read and understand.

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Circle 645 on Page 53

FOR HEAVY DUTY FOUNDRY SERVICE AT A SURPRISINGLY LOW PRICE...

Lodestar®
ELECTRIC HOIST

New Larger Capacity, Faster Speed Models

NOW—Greater selection from a complete range of capacities and speeds... ½ to 2 tons and 8 to 60 fpm.

...THE FIRST TRULY HEAVY DUTY VERSION OF THE SMALL ELECTRIC HOIST

Featuring:

- **Push Button Control**
- **Self-Adjusting Heavy Duty Magnetic Brake Plus Ultra-Modern Regenerative Electric Braking**
- **Sealed-in Lifetime Lubrication**
- **Fully Enclosed Components**
- **Lowest Headroom**
- **"CM-Alloy" Flexible Link Chain**

REQUEST catalog and name of local stocking distributor.

CM HOISTS

CHISHOLM-MOORE HOIST DIVISION
Columbus McKinnon Chain Corporation
Tonawanda, New York
Regional Offices: New York • Chicago • Cleveland
In Canada:
McKinnon Columbus Chain Ltd., St. Catharines, Ont.

Circle 637 on Page 53

heated to 650° F for 4 hours, and thicker sections longer. Shapes may be stored until required, then heated to service temperature.

For finer surface finish and stronger shapes or molds, a mixture of 6.5 to 8.0 parts by weight of zircon sand; 2 to 1 parts tabular alumina, minus 325 mesh; 0.5 to 0.3 parts calcium-aluminate cement, and 1.0 to 0.7 parts phosphoric acid with 5 to 10 per cent water, may be employed.

In mixtures where calcium-aluminate cement is used, water and phosphoric acid should be mixed together and cooled to room temperature before addition to lengthen the working time.

High-alumina Castable Refractories for Ladles, by Stanford O. Smith, Texas Foundries Inc., Lufkin, Texas, related to experiences with a proprietary, calcium-aluminate bonded, 96 per cent aluminum oxide refractory in 8000-lb, teapot tapping ladles. Material is dry mixed for 1 minute, 10 per cent water is added, and further mixed for 3 to 4 minutes. Prepared material is vibrated into place between an inner steel form and the ladle by use of an ordinary concrete vibrator.

Use of the material resulted in casting quality improvement due to reduction of ladle refractory inclusions, slag defects, and misruns. Ladle refractory costs were reduced with lower labor and mechanical repair costs to maintain ladles. Increase in ladle capacity was obtained due to lack of slag build-up in the ladle.

Session closed with brief descriptions of useful ideas employed in some foundries. Those included inner forms for ramming linings in ladles, trunnion band on large teapot ladles, shot-making machine for sampling, evacuated glass tubes for sampling, graphite protective tube for immersion thermocouple, use of closed circuit television between the demand meter and the control panel, and use of an oxygen, natural gas torch in speeding up meltdown in the electric furnace.

Baroid Appoints Distributor

General Refractories Co., 806 Board of Trade Bldg., Indianapolis, has been appointed distributor for Baroid Chemicals Inc., Houston.

metal abrasives
TAILOR MADE
for you...

We can now make, and deliver in every shipment, the exact type of "Malleabrasive" shot or grit that will do **your** particular job best . . . and at lowest cost to you.

With new, precision controlled equipment and specialized techniques "Malleabrasive" is now job-made to meet each individual cleaning condition.

Why settle for make-shift, general purpose abrasives when you can have "Malleabrasive" tailor-made for you? We'll welcome the chance to tell you how you can benefit.

Write us

THE GLOBE STEEL ABRASIVE CO.
Mansfield, Ohio

Sold by many leading distributors of foundry supplies from coast to coast.

MALLEABRASIVE

Circle 638 on Page 53

Man to Man

By RALPH L. LEE, *President*

Lee Hobby Foundry
Birmingham, Mich.

"It's how we use tools that counts, and it's amazing how different results can be with the same tools in the hands of different folks"

Fads and Foundries

● WHILE stashing away a number of novel knickknacks I had received as Christmas gifts, I found that the two cigarboxes I kept in the back of my lower dresser drawer for storing such treasures were filled to overflowing with the gleanings of previous years. Dumping both boxes out onto the floor, I found quite an amazing assortment.

They contained cigarette lighters of every vintage, principle, and design. Pocket knives ranged from a miniature, the size of which was its only bid for distinction, to quite a weapon, equipped with a corkscrew and a spoon—for cleaning out horses' hooves, I think. Others were ingenious key rings and containers, one with a flashlight for use after company parties; a perpetual pocket calendar; and several ornate pillboxes.

Pencils and Pens—But the bulk of the collection had to do with writing and drawing. Fountain pens represented the history of their development from those filled with eyedroppers to those charged, like rifles, with cartridges. The ballpoint variety had even a larger representation. Then followed refillable pencils, some with fat greasy leads and others with needle-like refills. One was designed to write in three or four colors—one color at a time, of course.

I couldn't possibly remember where they all came from, how many I bought, or how many were gifts. I do recall, however, my ohs and ahs together with those of others, when for the first time we saw one of these tricky innovations and felt an urge to have one of our very own. Of course, as the fad spread and everybody and his uncle already had bought or seen one of the gimcracks, some found their way into one of the boxes in my dresser drawer.

The fact that many of these exciting innovations did not measure up to the advantages originally promised does not discourage me one tiny bit from getting all excited over the promise of an interesting innovation, nor am I afraid to join the herd in its stampede toward a fad. In fact, I doubt whether we would find life worth living were it not for the hope for innovations, cure-alls, shortcuts, problem disintegrators, and suchlike.

Where are the fads of yesteryear?

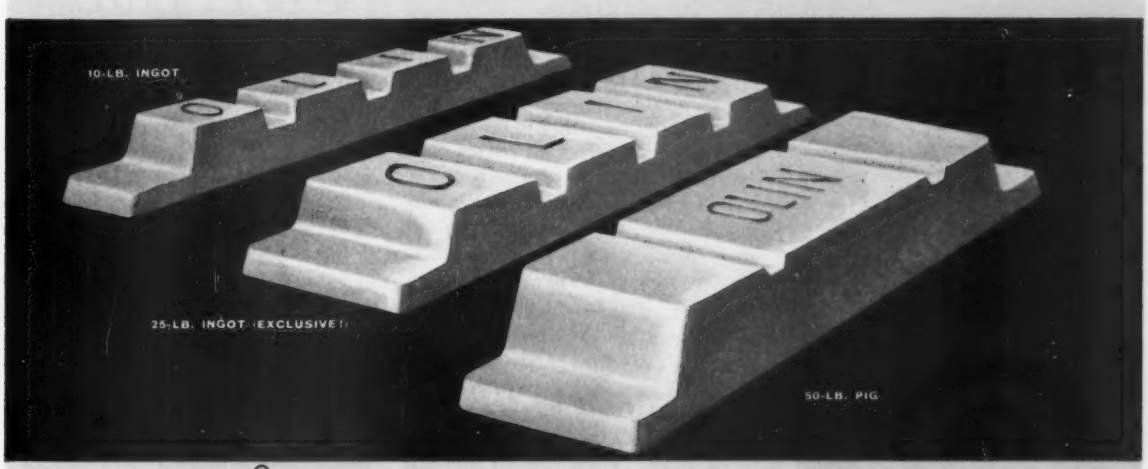
Foundry Innovations—As I sat on the floor before my museum, with my legs going to sleep, my mind recalled the exciting innovations which have come to our attention in the Lee Hobby Foundry.

Hot blast for cupolas, for instance. We hardly could keep our shirts on when we first heard of it—even planned to install one on our 10-in. job, after meeting a number of enthusiastic advocates, both users and dreamers. Then we became somewhat confused when we heard some high-voltage pro and conning on the basic economics involved. I recall that it was quite some time before actual experience cooled off debate and hot blast settled down to a legitimate, well earned place where it's needed. We're still going to fix up our cupola, one of these days.

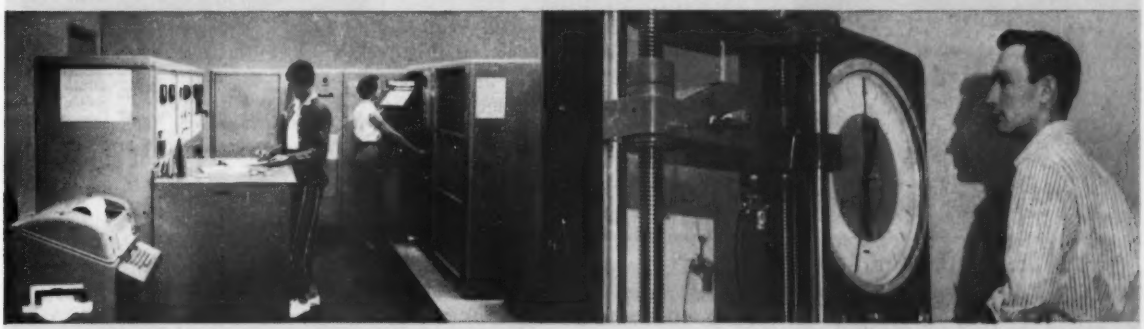
From what we hear, moisture control of blast has pretty much followed the same route through the fad stage and has shaken down to almost an indispensable requirement for certain kinds of exacting melting.

In my humble and amateurish

HOW OLIN ALUMINUM HELPS YOU BREAK INTO NEW CASTING MARKETS



MORE EFFICIENT FORMS. pig and ingot come in standard alloys, in 10, 25 and 50 lb. sizes. The 10 and 25 pounders feature smaller size to increase handling efficiency and speed melting, deep notches for easier breaking, 4-section design for faster crucible charging.



KNOWN CHEMICAL PROPERTIES. Every melt of Olin Aluminum undergoes exacting metallurgical and foundry controls. For example, using quantometric analysis, skilled metallurgists analyze samples of Olin Aluminum for all critical elements . . . and record the results electronically.

PREDICTABLE MECHANICAL PROPERTIES. Batteries of testing devices like this tensile machine are used to check testing bars of Olin Aluminum for tensile, shear, compressive and twisting strength.

You create a new market every time you persuade a prospect that aluminum castings will improve his end product.

Olin Aluminum can help you prove that point in the first place . . . and can help you keep your customer "sold" thereafter. That's because we provide you with:

- **Primary metal—made to the most critical "specs" for your most demanding jobs.**
- **Prompt, thoroughly qualified technical assistance.**
- **Ready access to Research and Development.**

Join those firms that are expanding their operations by finding new and better applications for aluminum castings. Make Olin Aluminum your source of superior casting alloys *—and* of metallurgical know-how.

Write for helpful engineering and availability data on casting alloys—Brochure R 13

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In Toledo, Melter J. R. "Teto" Nonis and Unitcast Corp.
GET MORE HEATS FROM ELECTRIC FURNACE WITH
RAMMED ROOF* of STEEL-LINE
*center section

NO SPALLING TROUBLE AS ROOF TEMP HITS 3300° F
around the electrode openings where large cross section, high-cost silica brick have been replaced by
IRONTON STEEL-LINE
This new dry refractory mix outlasts silica brick, may permit you to use smaller ports to save heat. Ironton **STEEL-LINE** speeds and simplifies roof building, saves labor, cuts expensive inventory of silica shapes. Write for performance report now.

SINCE 1917 THE IRONTON FIRE BRICK COMPANY IRONTON, OHIO
1325 Ashtabula St.
Write or call JE 2-3621 collect for name of area representative

Circle 640 on Page 53

opinion, I don't see how there could have been anything more exciting than the great news of nodular iron. Just the thought of being able to bend iron melted in a cupola sent shivers up and down my spine. And I'm not over the thrill yet, after learning that this wonderful process is quite demanding for the advantages it provides. You have to serve an apprenticeship at it before you know what is what. Even so, it's been a godsend and is spreading healthily.

Shell molding certainly has leaped ahead and proved itself in an ever expanding field of application. It has riddled fact from fancy and settled down to its legitimate place after all considerations were taken into account.

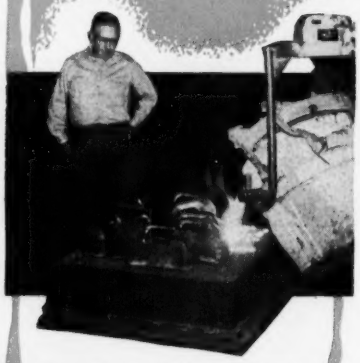
CO_2 bonding has graduated from the pulling-rabbits-out-of-hats stage. Fears of dyed-in-the-wool green sand molder fanatics have lessened considerably as experience proved that there is room for both schools of thought. Each has its rightful place.

Water-cooled tuyeres and melting zones, basic and acid linings, wonderful refractories, inoculants, testing techniques—one new, exciting thing after another. I'll bet my old Grandpa Lee (that's my molder grandpa), were he to come alive today, wouldn't believe what has happened in the foundry since he laid down his shovel.

It's Up to the User—A thought suddenly dawns on me concerning those automatic pens and pencils I was telling you about. Even though they proved to do all they were supposed to do and kept on doing it through thick and thin, they couldn't have done much without me on one end. All of the research and engineering invested in their development couldn't possibly help me much with what I wrote or drew with them. Granted that I was spared the time it would have taken to sharpen a pencil, dip the pen in ink, or look for the right colored pencil, what I did with them was my sole responsibility.

It just seems to me here in the Lee Hobby Foundry, writing as this new year begins, that we certainly should take advantage of every development, improvement, and new technique or process which shows signs of paying for itself when ap-

At Unitcast Corp.
Tough, new STEEL-LINE
ends worry about "REFRACTORY DRIP" in our 3100° ladles
Says Superintendent Shiffler



TWICE THE SERVICE
from ladle linings means lower production cost and higher quality in electric steel castings. "Afternoon Boss" Gayle Shiffler gets real satisfaction with 2" of new high-alumina
IRONTON STEEL-LINE
rammed in ladles of 350# capacity. At Unitcast, on a 16 hour day, ladles stay in service a week with **STEEL-LINE** . . . double the former lining life. **STEEL-LINE** decreases slag inclusions; ladle covers are dripless, ladle lips are easy to keep clean, ladle walls are non-wetting.

SEE **STEEL-LINE** IN ACTION in your foundry. Write or call Ironton to make arrangements for proof of performance.

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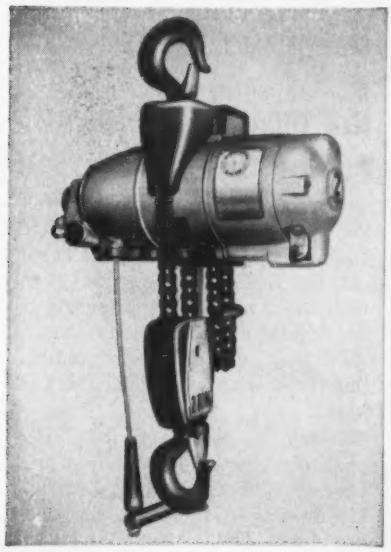
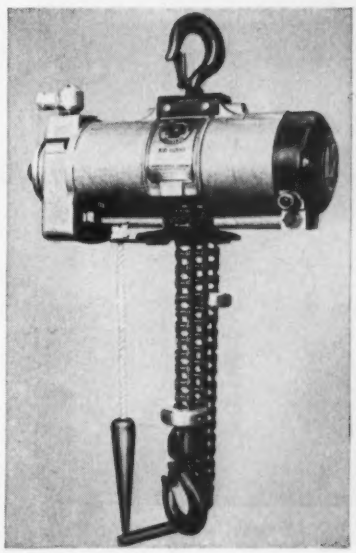
Circle 641 on Page 53

Air Hoists . . .
a complete line for loads to 4000 lb.

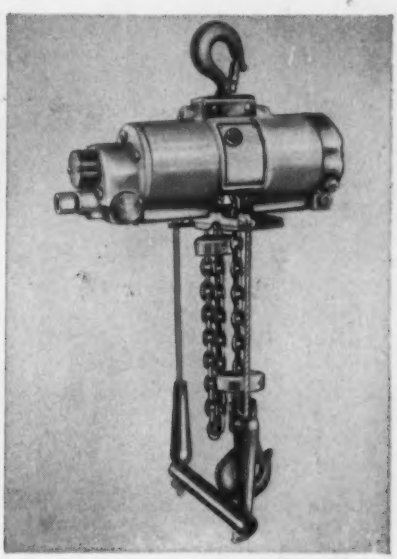
Get the lift, the power and the speed you need with *built-in safety*. Choose from Gardner-Denver's complete line of lightweight, easy-to-use air hoists. *Both piston and rotary types available.* With air power, you're assured of nonsparking operation. Air motors can't be damaged by overload stalls . . . can't burn out from continuous use. Motor is sealed from outside dirt, dust, moisture or corrosive fumes. Be sure your next hoist is a Gardner-Denver air hoist. Write for descriptive bulletins.



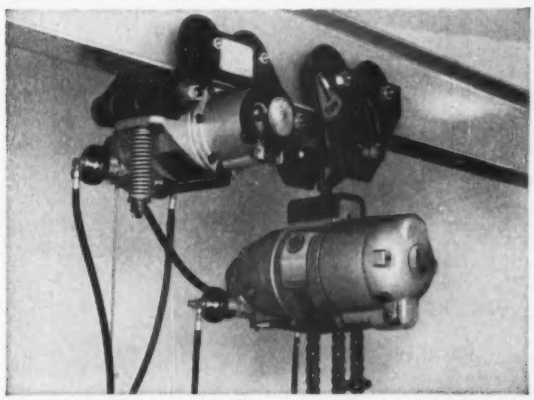
A heavy-duty hoist—The safe, sure lift you need for the heavy jobs with Gardner-Denver air hoists from 1000 to 4000 lb. Operator controls load with one hand . . . hoist does all the work.



A high-speed hoist—Combining lighter weight and higher speeds where fast lifts are of primary importance, Gardner-Denver rotary hoists are available in capacities of 1000 and 2000 lb.



A light lift—Handy, lightweight Gardner-Denver air hoists take the strain out of repetitive lifting . . . save time . . . cut operator fatigue. Capacities to 1000 lb.



Power on the beam—A time- and muscle-saving team, Gardner-Denver air hoist and "Hoistractor." Hoist lifts and lowers . . . "Hoistractor" moves hoist and load along the beam. Bulletin 87-1.

SPECIFICATIONS

Model	Capacity, lb.	Standard** lift, ft.	Speed, fpm	Weight, lb.	Bulletin No.
86-2V40	4000	8	10	100	86-1
86-2V20	2000	8	19	78	86-1
86R-20*	2000	8	20	30	86-71
86R-10*	1000	8	40	27	86-71
86-2V10	1000	8	38	78	86-1
86-1V10	1000	8	19	28	86-1
86-1V5A	500	8	38	28	86-1
86-1V3	300	8	80	28	86-1
86A-1*	150	8	45	14	86-1

*Rotary motor hoists—all others are axial-piston motor hoists.
**10-ft. lift optional.

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

Circle 642 on Page 53

lasts *over twice* as long as other belts!

Handling hot shakeout sand demands a belt that is really rugged. That is why a 355 ft. length of 30" x 7 ply Super-Insulated Sahara* is used for this gruelling sand reclaiming operation at this tractor foundry.

This belting thrives on heat and abrasion that kill off other belts 2 to 5 times faster . . . does a better job at far less cost to you.

Its special INNERLOCKED* construction of heavy-duty hard silver duck, long-fiber asbestos insulation, and exclusive impregnating compounds will give you maximum resistance to temperatures up to 600 degrees. Let Imperial solve your foundry needs. Time to start—Now.

Phone or write for complete information on how Imperial's Super-Insulated Sahara* can serve you better . . . cost you less.

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You expect MORE from Imperial . . . and you get MORE!

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( ) I'd like a free belting survey of my plant

( ) Please send your catalog and engineering handbook.

Name_____

Company_____

Address_____

plied to our specific needs. We also should keep in mind our experiences with innovations and developments of the past. Fads certainly have not proved themselves reliable.

Even with the very best tools, like pencils or pens, it's how we use them that counts. And it's amazing how different the results can be with the very same tools in the hands of different folks.

New Officers and Directors Are Nominated by AFS

Norman J. Dunbeck, vice president, Industrial Minerals Div., International Minerals & Chemical Corp., Skokie, Ill., has been nominated as 1960-61 president of the American Foundrymen's Society, subject to election at the annual business meeting in Philadelphia in May.

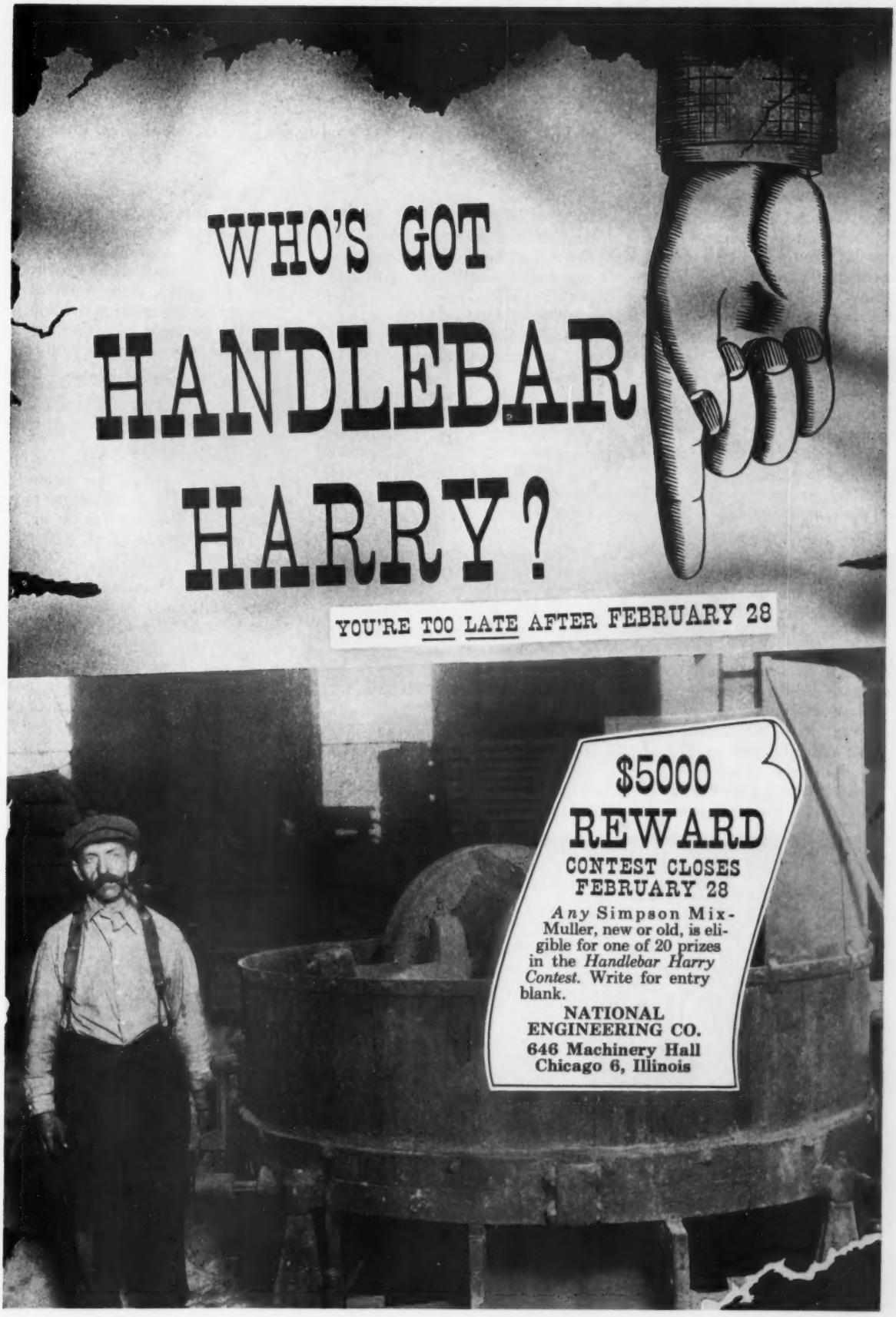
Albert L. Hunt, executive vice president, Superior Foundry Inc., Cleveland, was picked by the AFS Nominating Committee for vice president. The following have been nominated as national directors to serve three years:

Robert R. Ashley, foundry manager, Detroit Controls Div., American Radiator & Standard Sanitary Corp., Bridgeport, Conn.; Donald E. Webster, foundry superintendent, American Laundry Machinery Co., Rochester, N. Y.; Walter E. Sicha, chief, Cleveland Research Div., Aluminum Co. of America, Cleveland; James T. Moore, vice president, Wells Mfg. Co., Skokie, Ill.; Warren C. Jeffrey, product development manager, McWane Cast Iron Pipe Co., Birmingham; Hubert Chappie, foundry superintendent, National Supply Co., Torrance, Calif.

Foundries Win Top Awards in Methods Improvement Contest

Texas Foundries Inc., Lufkin, Texas, won first place for companies with fewer than 1000 employees in the annual Methods Improvement Competition sponsored by the Industrial Management Society. Wagner Castings Co., Decatur, Ill., was a second place winner. The awards were presented at the IMS Clinic held in Chicago, Nov. 4-6.

Circle 643 on Page 53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HANDLEBAR
HARRY?
YOU'RE TOO LATE AFTER FEBRUARY 28
$5000
REWARD
CONTEST CLOSES
FEBRUARY 28
Any Simpson Mix-Muller, new or old, is eligible for one of 20 prizes in the Handlebar Harry Contest. Write for entry blank.
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Around the Country

NEWS REPORTS FROM

Boston . . . Philadelphia . . . Pittsburgh . . . Cleveland . . . Chicago

Cleveland—Malleable iron castings producers are looking forward to their best year since 1955 and possibly their best of all time, according to Lowell D. Ryan, executive vice president, Malleable Founders Society.

Forecasts based on backlogs and analyses of major market areas indicate a flow of malleable castings in 1960 in excess of 1 million tons. The industry record is 1,105,000, turned out in 1955.

Malleable producers expect an accelerated demand in the early part of 1960 as inventories are built up again and production is increased in many industries. Contrary to expectations, the steel strike had only a slight adverse effect on malleable demand in 1959. Despite work stoppages in the auto and related fields, 1959 shipments are believed to have been about 910,000, or less than 2 per cent off industry estimates for the year.

Biggest bulge in consumption is expected from the auto industry, which normally uses about half of the malleable produced in the United States. Detroit's demand for malleable components in 1959, in the face of a long steel strike, reached the highest since 1955. In 1960, automobiles and trucks are expected to use 14 per cent more pearlitic and ferritic malleable castings, and this estimate may be conservative if the automotive goal of 7 million new passenger vehicles is realized.

The coming demand in the auto field looks so promising that seven top foundries which specialize in supplying the auto industry have expansion plans, either just completed or under way, to provide an extra 95,000 tons of capacity in 1960.

Over all, the malleable industry is expected to accelerate its output by 12 per cent in 1960, indicating a yearly production of 1,023,800 tons. Other fields in which significant increases are expected are railroads, 32 per cent, and machinery, including electrical, 11 per cent.

A "normalized" malleable production, based on monthly production of the material, seasonally adjusted from 1951 through 1957, was used as the par for charting the trend through this year and next. Normal production was exceeded for four straight months in 1959, but dropped slightly when effects of the steel strike were felt.

On the basis of pent-up demand, production in excess of this average is indicated for the first six months and beyond in 1960. The accompanying table shows shipments by quarters, with estimates for the last quarter of 1959 and all of 1960.

Shipments of Malleable Castings

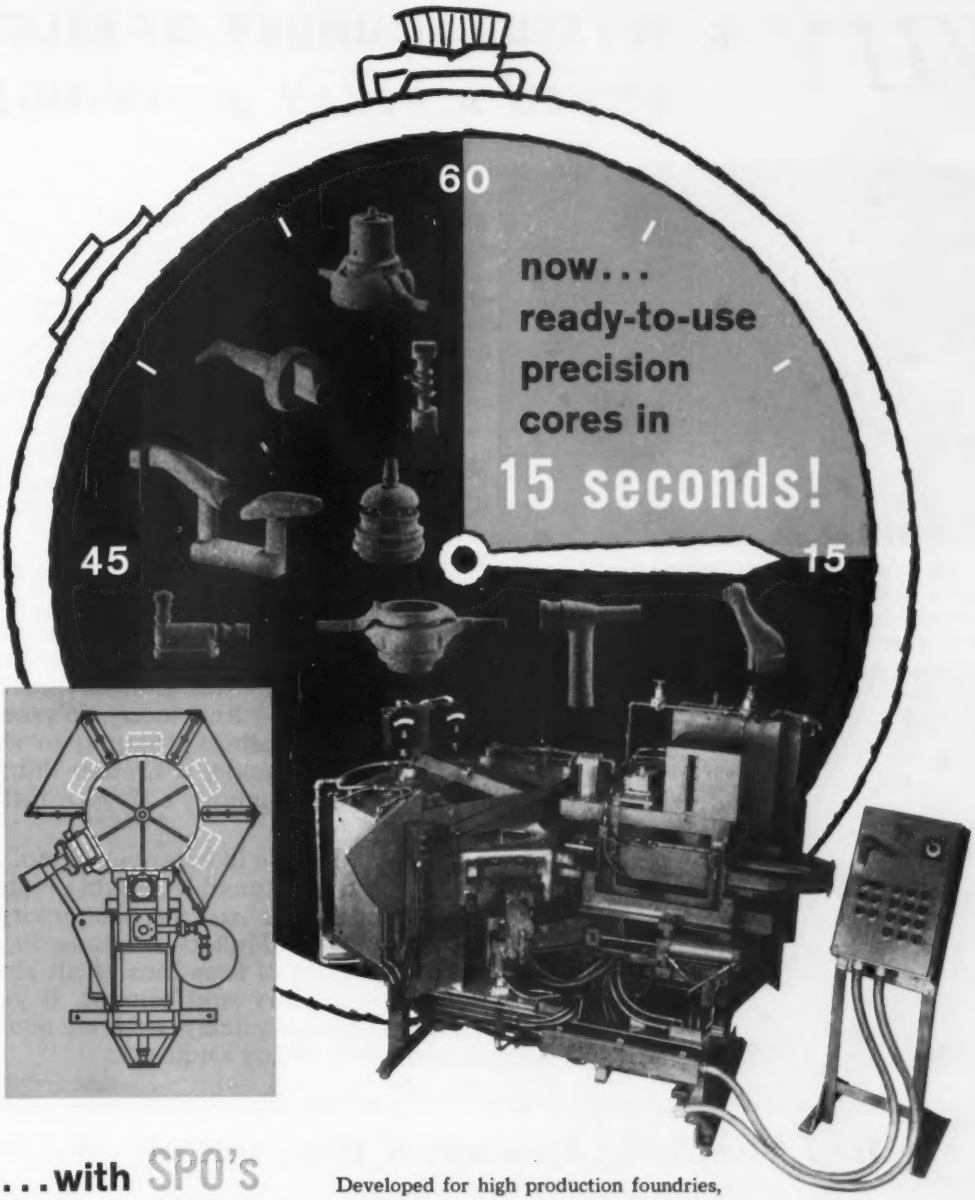
Quarter	1958	1959	1960*
First	169,100	232,300	290,000
Second	150,900	260,000	294,800
Third	148,000	210,200	216,900
Fourth	192,800	207,500	221,200

*Estimated

Boston— Gray iron foundry melt will be a few points higher through February but recovery from the late-1959 slump is slow and spotty. By the end of the current quarter most shops expect to be back on five-day-week schedules as demand for castings begins to broaden. Most orders continue to be for prompt shipment and backlogs are slim.

The textile machinery group is

CASTINGS FOR ORDNANCE: This group attended the first meeting of the newly organized Production Techniques Division Casting Committee of the American Ordnance Association. The meeting, held at Watertown Arsenal, Nov. 19-20, was headed by Stowell C. Wasson, vice president, National Malleable & Steel Castings Co., Cleveland. He is shown, front row center, flanked by Maj. Gen. A. Schomburg, Deputy Chief of Ordnance, at his right, and Col. C. E. Rust, Commanding Officer of Watertown Arsenal



...with SPO's automatic 6-station rotary holo-core machine

Developed for high production foundries, SPO's Model SC-10-R machine is capable of mass producing uniform standard hollow cores *in 15 seconds or less.* A six-station design, it will accommodate core boxes up to 10x12x6 inches in size. All operations except removal of finished cores are automatically controlled by precision valves and electrical equipment.

SPO Holo-Core machines . . . a new concept in core making equipment . . . facilitate new production techniques that assure substantially increased efficiency and economy. They can be installed as integral units in molding machine production lines because their *precision cores are ready to use only seconds after being blown.*

WORLD'S LARGEST SUPPLIERS SPO OF MOLDING MACHINES

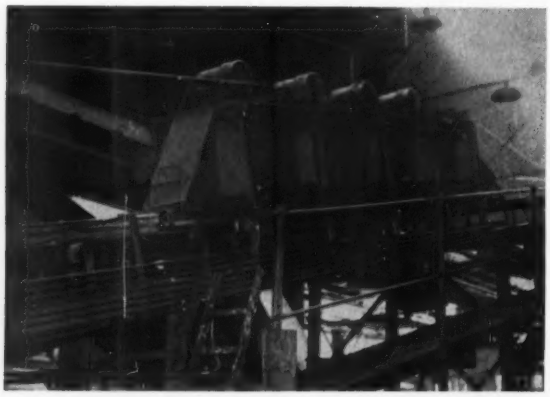
6617-S1

SPO INCORPORATED

6449 GRAND DIVISION AVE. • CLEVELAND 25, OHIO

FOR DETAILS AND PRICES, WRITE FOR BULLETIN SC-100.

WHY * WYSEUR FOUNDRY OF BELGIUM PICKED A *PEKAY MIXER-MULLER*



Wyseur Foundry's new automatic molding line is supplied with quality sand continuously by the Pekay Mixer-Muller, above. Below, close-up of the Pekay unit which is helping Wyseur to set new production levels.

When Wyseur Foundry of Courtai, Belgium, one of Europe's most progressive producers of quality grey iron castings, recently installed a new automatic molding line, they needed new sand preparation equipment to supplement it. Not only was a high volume of sand needed, but the sand also had to be of uniformly high quality.

Wyseur's choice: a Pekay Mixer-Muller.

Now installed, the Pekay unit independently performs all the operations needed to prepare sand — continuously, efficiently, economically. And today, Wyseur's production of castings, ranging in size from 110 to 260 pounds, is greater than at any time in the company's 88-year history.

Custom-built to fit any operational requirement and designed to operate either as independent or as supplementary units, Pekay Mixer-Mullers continue to serve a growing list of foundries of all kinds both in this country and abroad. If you need more sand—quickly and economically—contact a Pekay engineer.

*The 7 Money-Saving Advantages of *Every* Pekay Mixer-Muller!

1. **HIGH QUALITY**—3 times as much sand with increased permeability, flowability and green strength.
2. **LOW INITIAL COST**—Approximately one-third the investment of conventional units of equal capacity.
3. **LOW INSTALLATION COST**—Mounted on existing conveyor frames, eliminating costly foundations, building alterations, elevators and storage hoppers.
4. **LOW MAINTENANCE COSTS**—One foundry reports total costs of only $400 per year for parts and labor.
5. **LOWER OPERATING COSTS**—Less than one-half the peak horsepower needed by conventional units.
6. **NO COSTLY DOWNTIME**—Sectional drives overcome complete unit stoppage. Remaining sections continue to condition sand properly in case single section breaks down.
7. **COOLER SAND**—Exclusive Pekay mixer-mulling principle provides cooler sand for greater molding efficiency.

PEKAY MACHINE & ENGINEERING CO. INC.

871 N. SANGAMON ST. PHONE: TAYLOR 9-5530 CHICAGO 22, ILLINOIS

PEKAY COOLERATORS . . . ***High Speed, High Production Sand Cooling.***

PEKAY AIRATORS . . . ***The Only True Airator***

an exception; largest shops in this area are operating near capacity and have substantial backlogs in most cases. Four Massachusetts companies (all with foundries) share heavily in a $30 million contract for a 50,000-spindle textile plant to be built by Russia. They are Crompton & Knowles Corp., Worcester; Whitin Machine Works, Whitinsville; Rodney Hunt Machine Co., Orange, and James Hunter Machine Co., North Adams. Worcester and Whitinsville plants build looms and will start shipments late this year.

Mystic Iron Works, Everett, Mass., will dispose of its pig iron stockpile at unchanged prices—$68, Everett, for No. 2 foundry grade. Foreign iron is being offered below that price already and as supply dwindles at Everett more consumers are taking a serious look at foreign tonnage as a cost factor. Labor contract in the Boston area expires in May, hardening views on material costs and castings prices.

Malleable shops are operating at higher rate than gray iron foundries, but the improvement is somewhat spotty. Some shops have substantial backlogs and are melting on full five-day schedules. Belcher at Easton, Mass., has its best backlog in some years and the same holds for a Naugatuck Valley shop, melting six days. Most others, while more active, are not building up heavy backlogs.

Pittsburgh—Foundrymen have seen a moderate improvement in business since the steel strike ended but nothing to suggest that a production boom is in the offing. They are puzzled and disappointed by the slowness of recovery. Adverse effects of the strike are lingering.

Captive shops in some of the larger fabricating plants have not been able to resume full schedules because low steel inventories are retarding output of products in which castings are used. Machinery makers are still waiting for orders that were held up by the strike. Even foundries that supply the automotive industry say they are running below capacity.

A large gray iron jobbing foundry, known for its energetic sales methods, reports that operations jumped from 55 per cent of capacity in December to 75 per cent at mid-January. But it is a rare case. For the most part foundries here are continuing to run at about half speed, with backlogs next to nothing.

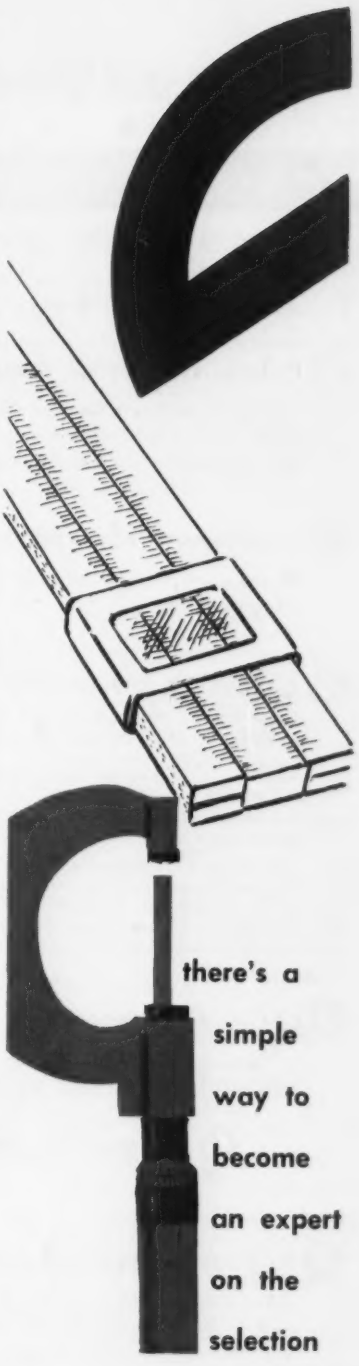
Resumption of near - capacity steelmaking operations has, of course, benefited two classes of foundrymen — roll manufacturers and ingot mold producers. They have seen an immediate improvement in sales. A leading rollmaker reports that December bookings spurted 50 per cent ahead of November, and that January sales continued at the December pace. With a 130 million-ton steel year in prospect, chances are good for record shipment of rolls. Ingot mold suppliers say business is booming.

With the signing of a new labor contract, steelmakers are expected to release orders that were held up when another strike threatened. It is apparent that they won't be able to run for long at 95 per cent of capacity without ordering more castings for maintenance and repair purposes.

Chicago— Settlement of the steel wage controversy was both good and bad news to gray iron jobbing foundries in the Midwest. It was good in that continuity of steel production and thereby of all metalworking activities is assured. It was disheartening, on the other hand, because the terms of settlement are definitely inflationary.

For several months, gray iron jobbing foundries were losing orders and backlogs were shrinking progressively. Many buyers of castings who utilize steel as well as castings in the products they make were running out of steel. So, to keep inventories of steel and castings balanced, manufacturers of consumer goods and industrial equipment reduced their buying of castings.

Resumption of steel production under the Taft-Hartley injunction produced no immediate upturn in castings orders, and even at year-end foundries were experiencing very little improvement in their backlogs. Most shops continued to run 32 to 40 hours a week but backlogs ranged only from one week to four weeks. Foundry operators who feel 1960 will produce a good business level, at start of the new year were seeing little evidence of mounting orders. The outlook at that time



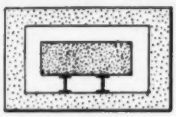
SEE NEXT PAGE . . .

use these handy FANNER selection charts to

FACTORS TO CONSIDER IN SELECTING CHAPLETS

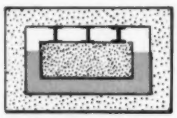
1 CALCULATE WEIGHT OF CORE

Purpose of chaplets in the drag side of mold is merely to hold core weight until metal is poured. Core weight = .06 lbs. per cu. Inch of Core



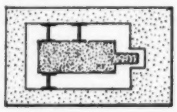
2 CALCULATE LIFT OF CORE

Purpose of chaplets in the cope side of mold is to withstand lift exerted by metal, which is 3.5 times the weight of the core for grey iron and 3.9 for steel. Core weight x 3.5 or 3.9 = Lift of Core



3 COMPENSATE FOR PRINTS AND SUPPORTS

Where prints or supports exist, load calculations should be reduced proportionately.



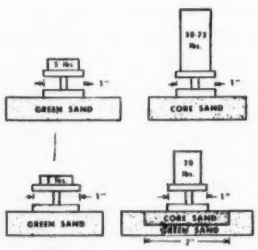
4 CALCULATE SUPPORTING CAPACITY OF SAND

Green sand in cope and drag will support approximately 5 lbs. per Sq. Inch. To determine required head area, divide load by 5 lbs.

$$\frac{\text{Load on Chaplet}}{5 \text{ lbs.}} = \text{Sq. Inches of Chaplet Head Area Required}$$

Baked Sand Cores will support 50 - 75 lbs. per Sq. Inch. To determine required head area (or bearing surface), divide load by 50 - 75 lbs.

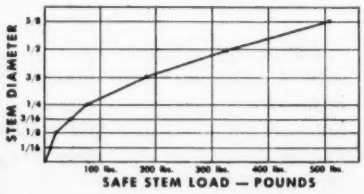
Where cores are so heavy that an excessive number of chaplets would be required, **ram-up** cores may be used to increase the bearing surface of green sand. For example: A chaplet with 1" head in green sand will support only 5 pounds. A 2" ram-up core (4 Sq. Inches) will provide a bearing surface to support 4 times 5 lbs., or 20 lbs.



5 CALCULATE SUPPORTING CAPACITY OF SAND

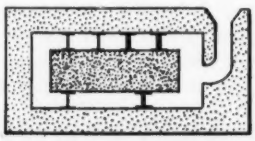
$$\frac{\text{Required Head Area (Sq. In.)}}{\text{Area of Each Chaplet Head (Sq. In.)}} = \text{Number of Chaplets Required}$$

6 USE THIS CHART TO CHECK SAFE LOAD ON STEMS



7 CONSIDER EFFECT OF LOCATION AND TEMPERATURE

When chaplet location is near the gate (heavy flow of metal), or, when steel is poured at high temperatures, allow up to 50% additional stem size to compensate for effect on chaplet.

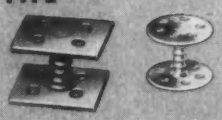
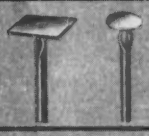
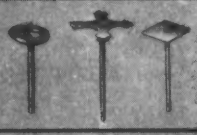
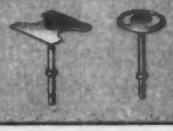


The chaplet you select for any casting can make a great difference in its quality . . . and in its overall costs. Too light or too small a chaplet may result in improper core support and a poor casting, too large or too heavy a chaplet increases chaplet costs unnecessarily. Use this graphic information to determine the correct chaplet to insure proper core support.

Write for free plastic laminated selection chart of chaplets.

insure proper selection of proper type of chaplets for your job

fine FANNER CHAPLETS are made in a wide range of types for every need

TYPE	CHARACTERISTICS	APPLICATIONS
MOTOR 	FUSE READILY STEMS CAN BE GROOVED HEADS CAN BE PERFORATED HEADS CAN BE TILTED STEMS CAN BE EXTENDED CLOSE TOLERANCES ±.002	***For Light Sections of*** **Motor Blocks • Heads • Housings Radiator Sections • Burner Sections • Pump Sections • Farm Equipment • Job Castings**
BUTTON HEAD OR BOILER	STURDY STRUCTURE FUSE READILY STEMS CAN BE GROOVED NON-SLIP BUTTON HEAD	***For Boiler Sections***
PERFORATED	10 STANDARD SHAPES MADE TO FIT ALL CONTOURS MADE TO ALL RADII DESIGNED FOR WEDGES LOW IN COST	***For Light Sections of*** **Stove Castings • Motor Castings • Job Castings**
DOUBLE HEAD	STURDY STRUCTURE STRONG SUPPORT TO CORE STEMS CAN BE GROOVED HEADS CAN BE CANTED RIVETED OR WELDED HEADS CLOSE TOLERANCES ±.005	***For Heavy Sections of*** **Machine Tool Bases • Diesel Engines • Locomotive Frames Side Frames • Pumps • Road Machinery**
SINGLE HEAD 	NON-SLIP FORGED HEADS FITTED HEADS WITH ANY RADIUS SOLID SUPPORT	***For Very Heavy Cores of*** **Diesel Engines • Machine Bases**
RADIATOR 	UNIFORM BREAK-OFF NICKS DEEP NICKS FOR FIRM KNITTING LOW COST	***For Radiator Sections*** **Burner Sections • Pump Sections Farm Equipment • Job Castings**
SHOULDER RADIATOR 	EASY TO PLACE FUSE READILY DEEP BREAK-OFF NICKS STAGGERED NICKS FOR FIRM KNITTING UNIFORM SHOULDERS	***For All Thin Sections of*** **Manifolds • Stove Burners Cylinder Heads**

SPECIFY FANNER GROOVESTEMS TO ELIMINATE LEAKERS

Your best insurance against faulty castings is the GROOVESTEM chaplet with the Countersunk Shoulders, Featheredge Fusion Rings, and Complete Contact Radius Grooves.

When you need chaplets remember that only FANNER makes a complete line for every casting requirement. Regardless of the kind of metal you pour or the type of casting you produce, you can secure the exact chaplet you need from this one source. As a result you always save time . . . reduce costs . . . step-up production when you standardize on FANNER for all your needs.

THE **FANNER** MANUFACTURING COMPANY

Designers and Manufacturers of Fine Fanner Chaplets and Chills

BROOKSIDE PARK CLEVELAND 9, OHIO

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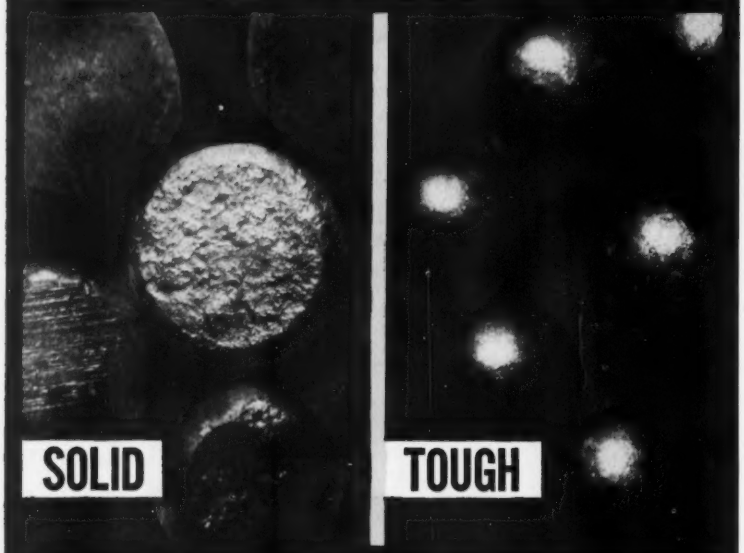
NOW ROTOBLAST STEEL SHOT
PROVES IT CUTS ABRASIVE COSTS!



Rotoblast Steel Shot has already stacked up an impressive record of reduced costs in foundries* and blast cleaning departments* from coast to coast!

- Atlantic Coast steel foundry—Compared with premium abrasive formerly used, Rotoblast Steel Shot cuts abrasive costs *in half*—and gives better cleaning than before!
- Southwestern manufacturing company—Now uses 7 lbs. of Rotoblast Shot per wheel hour, compared to 23 lbs. of malleable shot previously used!
- Large automotive foundry — Rotoblast Shot consumption 30% less than other steel shot tested; cleans castings faster!
- Eastern steel plant—Now uses Rotoblast Shot to descale steel strip, after exacting lab tests proved it better than previous steel abrasives!
- Midwest forge shop—Found Rotoblast Shot reduced abrasive costs 23% below that of abrasives previously used!
- Steel tank company—Cut cleaning costs in half (from 4c to 2c per sq. ft.) when it switched to Rotoblast Steel Shot.

These examples are just some of the many proving Rotoblast's cost-cutting qualities! Arrange a trial in your plant! Talk to your Pangborn man or write PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Maryland. *Manufacturers of Blast Cleaning and Dust Control Equipment—Rotoblast Steel Shot and Grit.*

*Names available on request

Pangborn

ROTOBLAST®
STEEL SHOT AND GRIT

was only poor to fair for the majority of shops.

Disturbing to foundries, of course, is the inevitability of higher steel prices stemming out of the new wage settlement.

Philadelphia—Casting demand here is getting off to a rather wobbly start in the new year. Malleable continues to do very well but in gray iron, steel, and red metals, the situation is spotty. Foundrymen look for a generally better year in 1960, however, and expect a rather definite upturn in February.

Some leading gray iron jobbers report December business as off 15 to 20 per cent from the preceding month, and indicate there has been no marked pickup in January. They have been operating close to five days a week, although with restricted working forces, and have only moderate backlogs.

Gray iron requirements for vacuum pumps and papermaking machinery are good, but power transmission and material handling needs lag. Machine tool requirements are described as very slow, and there has been a drop in die work, which until recently had contributed considerably to such limited activity as prevailed in heavy castings.

Steel foundry operations reflect the lag in heavy industrial equipment. While operating with restricted forces on a basis of close to five days a week, their average is little if any better than 70 per cent of normal rated capacity. Malleable foundries are running close to 85 to 90 per cent. Demand for certain construction items are slow, but orders for pipe fittings and hardware goods are strong.

Brass and bronze shops, which picked up some steam in the fall of last year, are gaining ground slowly following the year-end dip. Business in valves and water meters is active, with captive shops engaged in this work overflowing to the benefit of the independents. Shipyard foundries are doing a little better, reflecting navy requirements. Plumbing work is fair. Business with most aluminum shops is moderately good.

Hardinge Mfg. Co., York, Pa., is expanding its foundry at a cost of $300,000. It is adding about 25 per cent to its floor space (ground to be broken shortly), and install-

ing, among other items, a new core oven and additional sand preparation and handling equipment.

Malleable Founders To Discuss Technical, Operating Problems

More than 100 operating personnel are expected to attend the Malleable Founders Society's fifth Technical and Operating Conference to be held on Feb. 17-18 at the Wade Park Manor, Cleveland.

The meeting, open to members of the society, will be devoted to discussion of high-integrity castings, new production tools for the foundry, and better communications.

Francis B. Herlihy, chief metallurgist, American Brake Shoe Co., and Richard W. Heine, University of Wisconsin, will discuss high-integrity castings. This session will feature the subject of casting quality, tolerances, development of new techniques, and the degree of precision which can be attained in various molding methods.

The opening session will be devoted to the broad field of communications. An expert in this field, Dr. Wesley Wiksell of Louisiana State University, will give the lead talk: "Better Communications; Key to Improved Operations."

The morning session on the 18th will cover refractories and new molding processes. Six newer phases of foundry operations will be discussed briefly in the afternoon session, including nondestructive testing.

Program details follow:

Wednesday, Feb. 17

9:30 a.m.—Communications
"Better Communications; The Key to Improved Operations," Prof. Wesley Wiksell, Louisiana State University.
"Intra-Plant Communications," John T. Bryce, Albion Malleable Iron Co.
"Is Anybody Listening?," Lowell D. Ryan and Hans J. Heine, Malleable Founders Society.

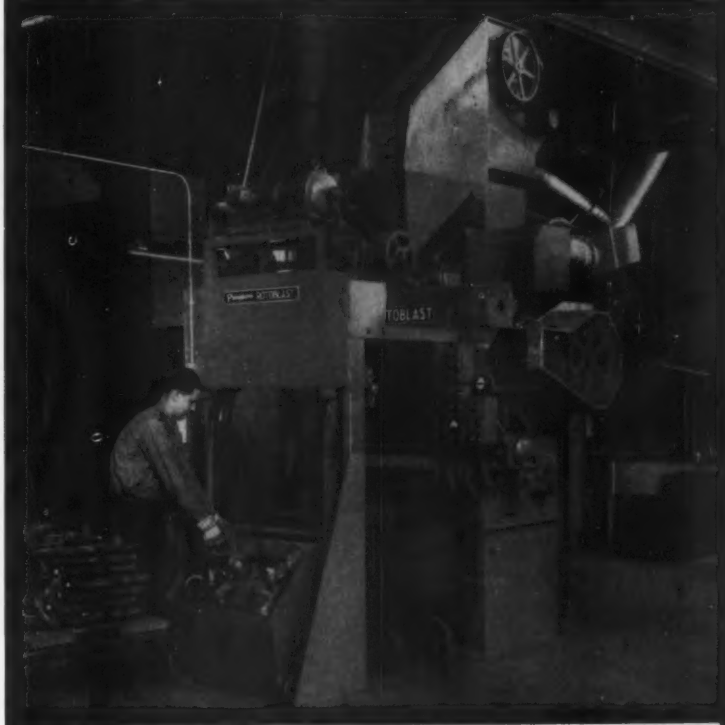
2 p.m.—High-Integrity Castings
"New Horizons in Casting Methods," Francis B. Herlihy, American Brake Shoe Co.
"Another Look at Molding Methods," Prof. Richard W. Heine, University of Wisconsin.

Thursday, Feb. 18

9:30 a.m.—Production Tools
"Electric Furnace Refractories," Richard De Walt, Lehigh Foundries Co.
"Advanced Molding Techniques," R. L. Page, Central Foundry Div., General Motors Corp.
"Refractories — the Overlooked Production Tool," Walter R. Jaeschke, Whiting Corp.

1:45 p.m.—Research Tools
"Radioactive Isotopes," C. M. Eberhart, Central Foundry Div., General Motors Corp.
"Spectroscopy," William H. Martin, Applied Research Laboratories.
"Ultrasonics," Ralph H. Frank, Sperry Products Co.
"The Parlanti Process," Dr. Conrad A. Parlanti, Niforge Corp.
"Radiography," Mark R. Rosumny, Picker X-Ray Corp.
"Statistics," Dr. W. Kenneth Bock, National Malleable & Steel Castings Co.

ROTOBLAST CUTS CLEANING TIME 70%!



Pangborn Rotoblast reduces cleaning time from 15 minutes per load to 4½ minutes at Buckeye Iron & Brass

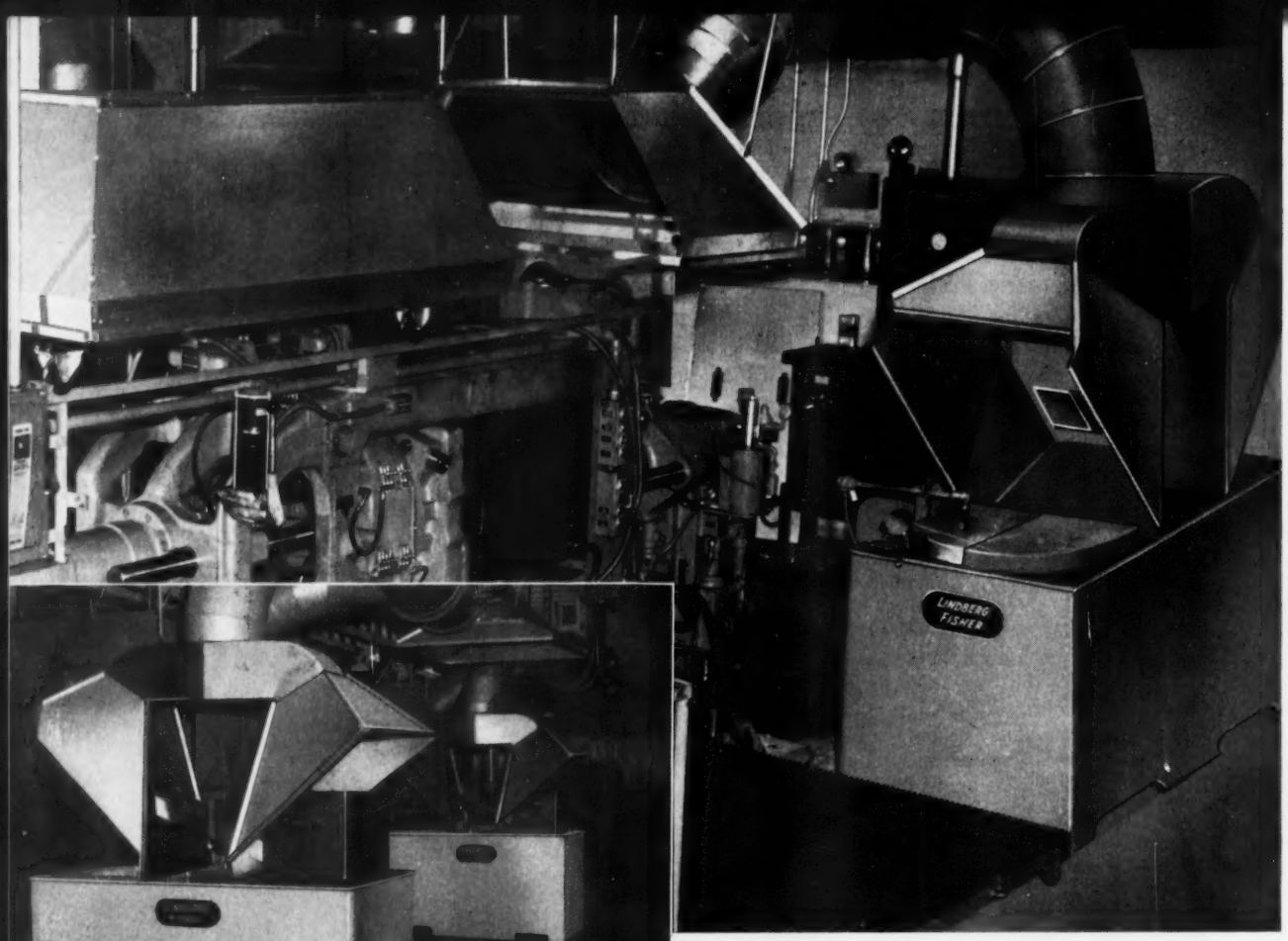
To reduce costs and still keep up production schedules, Buckeye Iron & Brass Works, Dayton, Ohio, replaced its centrifugal blast cleaning barrel (which is still in good operating condition) with an automated 6′ Pangborn Rotoblast Barrel. The result: cleaning time was cut from 15 minutes per load to 4½ minutes!

Through automation, the Rotoblast Barrel has also saved the company the cost of one full-time operator and has proved economical in terms of maintenance. In seven months, no repairs or replacements, other than vanes, have been necessary!

For full details on how Pangborn Rotoblast can save you money, write for Bulletin 1400 to PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Md. *Manufacturers of Blast Cleaning and Dust Control Equipment—Rotoblast Steel Shot and Grit.*

Pangborn CLEANS IT FAST WITH **ROTOBLAST®**

Circle 648 on Page 53



Lindberg Melting and Holding Furnaces at Electrolux Corporation, Old Greenwich, Conn., are conveniently spotted adjacent to die casting machines. Special furnace hoods remove accumulated gases.

Lindberg battery at Electrolux. These 80 KW two-chamber induction furnaces melt and hold aluminum for die casting Electrolux Vacuum Cleaner parts. Note convenient chute to return gates and risers to melting chamber with splash shield.

LINDBERG MELT AND HOLD FURNACES HELP DIE CASTING EFFICIENCY AT ELECTROLUX

Recently, Electrolux Corporation, Old Greenwich, Conn., decided to die cast parts for the famous Electrolux Vacuum Cleaner in their own plant. To insure greatest efficiency and to provide the most ideal layout and working conditions Lindberg Two-Chamber Induction Melting and Holding Furnaces were selected to supply aluminum for the die casting machines. Electrolux has found Lindberg equipment to be completely reliable, ideal casting temperatures are easily maintained and the absence of noise and burner heat assures comfortable clean working areas. Operation has proved so satisfactory that two additional Lindberg furnaces have been purchased and are now being installed.

Wherever or however aluminum needs heat there is Lindberg equipment to apply it most economically and efficiently. Furnaces for melting and holding, casting stations, remelting or heat treating are available in all capacities, electric or fuel fired. See your Lindberg Field Representative (consult your classified phone directory) or write us direct. Lindberg-Fisher Division, Lindberg Engineering Company, 2453 West Hubbard Street, Chicago 12, Illinois. Los Angeles Plant: 11937 S. Regentview Ave., Downey, Calif. In Canada: Birlefco-Lindberg, Ltd., Toronto. *Also factories in:* Argentina, Australia, England, France, Germany, Italy, Japan, Scotland, South Africa, Spain and Switzerland.

LINDBERG

Application of heat to Aluminum is a Lindberg Specialty

Heat and aluminum have been Lindberg's babies for many years. If your product requires the application of heat to aluminum anywhere along the line, we can help you do the job. From alloyed ingot and molten metal delivery from the reduction cells to the finished product Lindberg-Fisher furnaces meet *any* need for the application of heat to aluminum.

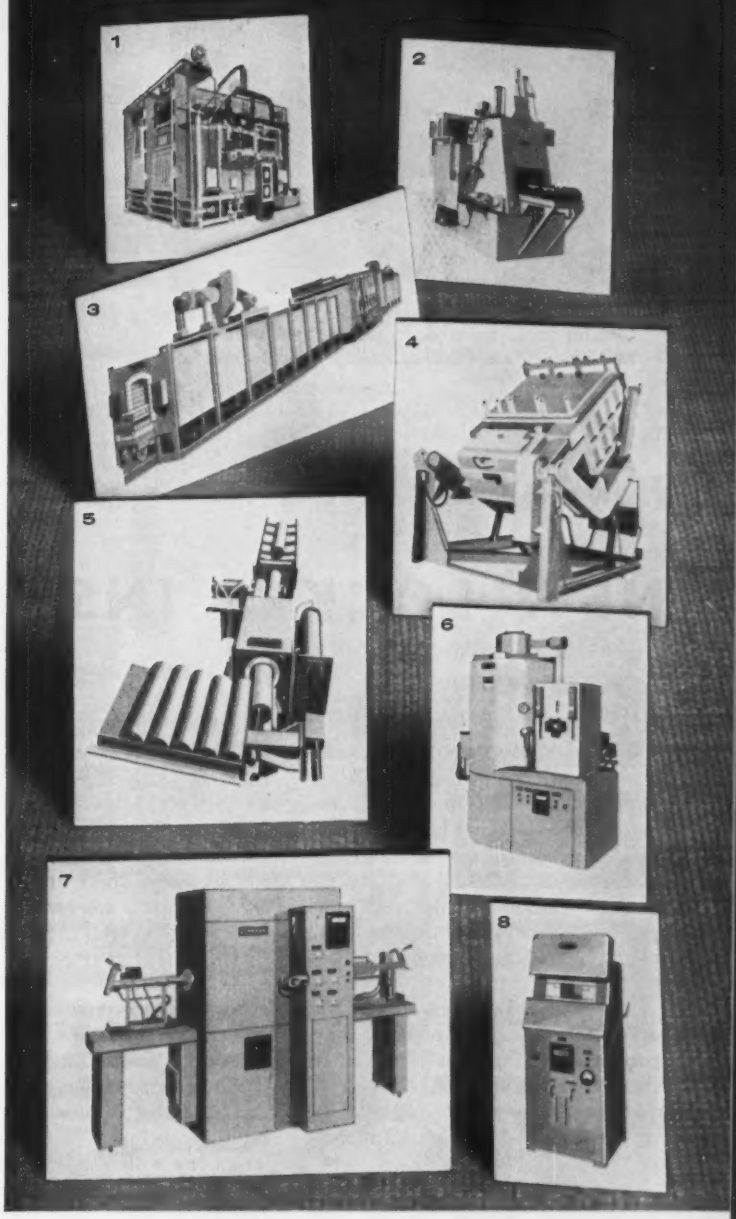
With Lindberg-Fisher furnaces, too, you get the expert technical skills of Lindberg Engineering Company's staff of engineers, metallurgists, technicians, widely experienced in all phases of aluminum melting, casting and treating. These are the people that engineered what we believe to be the largest installation of its kind, recently completed for one of the country's leading automotive mahufacturers . . . over 75 furnaces including huge reverbs for storing molten aluminum, and smaller melting and holding furnaces for casting stations.

Over the years they have been responsible for many of the most important developments in the application of heat to aluminum. For instance, the technique of putting a cast lining in Induction Melting Furnaces to provide big savings in initial cost and maintenance. Also the Lindberg Autoladle, the first practical automatic aluminum ladling unit ever made to make possible fast, dependable, and economical casting of aluminum.

Because Lindberg builds all kinds of melting equipment, gas—oil—electric (resistance, 60 cycle induction, arc or high frequency) . . . we can intelligently and objectively recommend the proper type of equipment for your particular conditions and needs. Get in touch with your local Lindberg representative (see your classified phone directory) or write us direct. Lindberg-Fisher Division, Lindberg Engineering Company, 2453 West Hubbard Street, Chicago 12, Illinois. Los Angeles Plant: 11937 South Regentview Avenue, Downey, California. In Canada: Birlefco-Lindberg, Ltd., Toronto.

heat for industry

THERE'S LINDBERG EQUIPMENT FOR EVERY INDUSTRIAL HEATING NEED



1 Melting and Holding Furnaces: Equipment for any non-ferrous metal requirement including electric resistance and two-chamber induction types, reverberatories, dry hearths and crucibles. Shown: Field-installed Reverberatory Furnace, 80,000 lb. capacity.

2 Heat Treating Furnaces: For every requirement, large or small, electric or fuel fired, factory built or field-installed. Shown: Automated Integral Quench Type Carbonitriding Furnace.

3 Ceramic Kilns: All types of kilns: automatic, atmosphere controlled, high temperature, tunnel and periodic. Shown: Tunnel Kiln with two automatic control zones for temperatures up to 3200° F.

4 Melting and Holding Furnaces: Equipment for any non-ferrous metal requirement including electric resistance and two-chamber induction types, reverberatories, dry hearths and crucibles. Shown: 350 KW Induction Furnace with 30,000 lb. capacity.

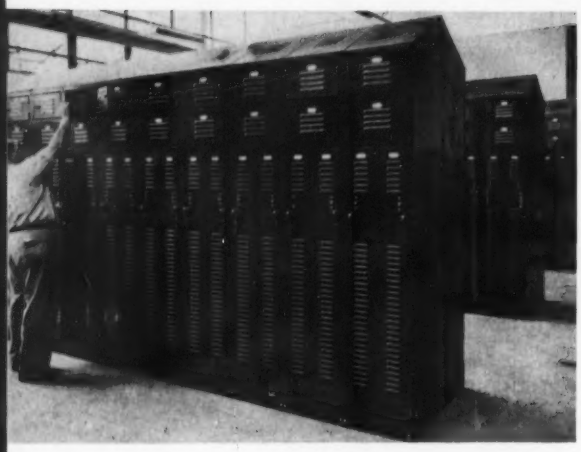
5 High Frequency Units: Complete range of induction heating units and furniture. Shown: New Induction Billet Heater for aluminum extrusions.

6 Atmosphere Generators: Generators for all required furnace atmospheres. Shown: Hyen Generator for endothermic atmospheres.

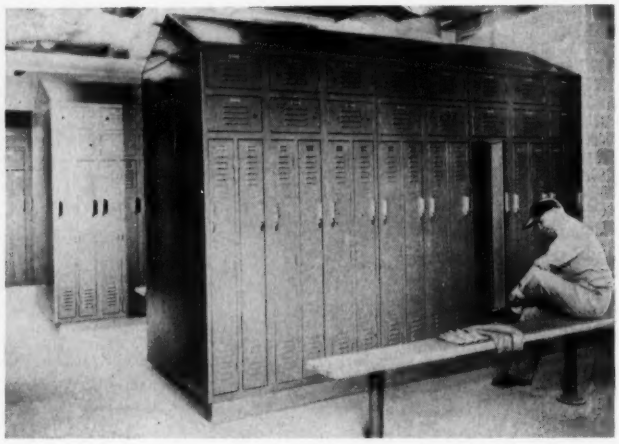
7 Pilot Plant Equipment: Complete group of intermediate sized furnaces for pilot plant and small production application. Shown: New Graphite Tube Furnace, temperature range 2500° F. to 5000° F.

8 Laboratory Furnaces: Complete line of laboratory furnaces from simple hot plates to specialized research units. Shown: Versatile, wide temperature range Laboratory Box Furnace.

Circle 649 on Page 53



Sloping tops, extra door louvers, perforated tops and closed base customize these lockers



Lockers mounted on raised concrete bases protect contents from moisture during cleaning

How To Customize a

NEW LOCKER INSTALLATION

By C. D. CANNON
Manager, Engineering Services
Penco Div., Alan Wood Steel Co.
Oaks, Pa.

● LOCKERS are too often thought of as vertical boxes with doors, and scant attention is paid to truly functional locker arrangements. A number of not-so-obvious benefits, however, are realized by "customizing" your new locker installation. "Customized" locker facilities can improve sanitation, ventilation, employee morale, and property protection.

Essentially, lockers are made by assembling a number of basic components. By ingenious selection of the components used in your lockers, you can achieve a "customized" installation—using only standard components.

This article outlines ten ways to achieve the benefits of this type of installation.

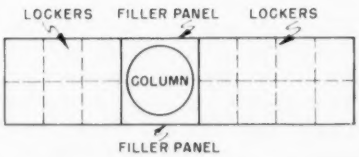
Sloping Tops — Where locker room appearance is important, specify sloping tops. These tops slope at an angle of about 30 degrees to help prevent the accumulation of dust and debris common with flat tops of standard locker units, thereby promoting better housekeeping.

Closed Base—The dirt-catching area under conventional lockers can be eliminated by adding a steel base closure to cover the open space beneath. This will also give your locker installation a neat flush-front appearance.

Raised Concrete Base—In locker rooms where floors are mopped or hosed, lockers can be protected from moisture and dirt by mounting them on a concrete base, instead of on the standard steel legs. Raised concrete bases provide a neat appearance and add stability and rigidity to locker installation.

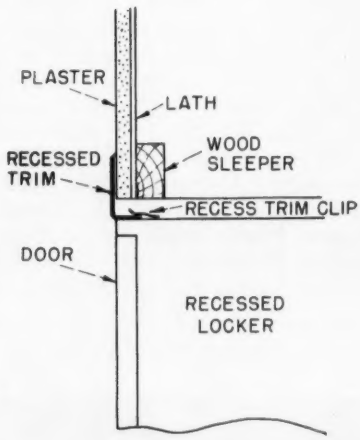
Filler Panel—Many areas where locker assemblies are situated have building columns and other obstructions which interfere with the arrangement of lockers in orderly, continuous lines. Steel panels of the same steel material and finished to match the lockers can be used to fill openings such as these. Filler panels add orderliness to locker installations and improve housekeeping.

Recess Trim—Where lockers are recessed into walls, in such locations as offices, there is a gap along the top and ends between the edge of the recess opening and the lockers. If left uncovered, this gap



Filler panels blend the column into the locker installation

Recess trim is used to cover the gaps around the built-in locker



makes the installation unattractive and hard to keep clean.

To improve the appearance and cleanliness of recessed units, this gap usually is covered with strips of molding trim. The trim is held in place by recess trim clips attached to the tops of the lockers.

Louvers—Where work clothing is stored, a great amount of circulating air often is required to keep it dry and fresh. Openings in standard lockers often are inadequate to provide enough circulation. Doors can be produced with additional louvers, extending the full length of the door, to provide more circulation.

Mesh Doors—A maximum amount of air and light is admitted through locker doors provided with panels of expanded metal mesh. In addition to providing air circulation, mesh doors permit easy inspection without opening the doors.

Perforations—In lockers that are not recessed, additional air circulation can be provided by perforations in backs and tops. These ventilating perforations generally consist of ½-in.-diam holes, spaced 1 in. apart, center to center, and grouped in rectangular units of about 42 holes each.

Vertical Partitions — If athletic clothes or work clothes are placed in the same locker with street wear, the clean clothes often are soiled by coming in contact with the dirtier ones. To overcome this condition, lockers can be furnished with full-length vertical partitions extending from the back almost to the door. Partitioned lockers, often called "dual lockers," are good morale builders.

Locks—By selecting the type of lock to match your particular requirements, you can improve appearance and convenience in addition to providing protection and control over locker contents.

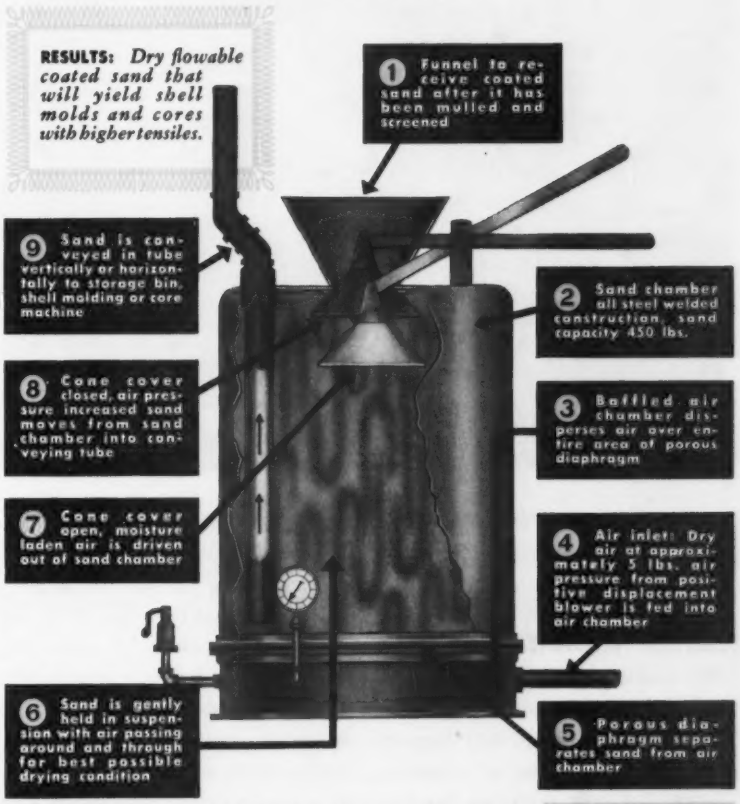
Standard lockers are equipped with door handles into which padlocks can be inserted. Most steel locker manufacturers also are prepared to furnish doors with built-in combination or key operated locks. Both types usually are master-keyed so they can be opened for inspection by authorized personnel.

Standardized, built-in locks make locker installations look neater than an assortment of padlocks provided

CHICOPEE SAND DRYER & AERATOR TANK

New, Inexpensive Method of Drying Coated Sand

You get dry, flowable coated sand in a matter of minutes with the new Chicopee Sand Dryer and Aerator. This inexpensive sand conditioner takes sand, after mulling and screening, air-dries and conveys it under low air pressure to storage bin, shell molding or core making machine. The low air pressures used for drying and conveying assures retention of resin coat on sand grains, giving you higher tensiles in shell molds and cores using minimum resin percentages.


RESULTS: Dry flowable coated sand that will yield shell molds and cores with higher tensiles.
1 Funnel to receive coated sand after it has been mulled and screened
2 Sand chamber all steel welded construction, sand capacity 450 lbs.
3 Baffled air chamber disperses air over entire area of porous diaphragm
4 Air inlet: Dry air at approximately 5 lbs. air pressure from positive displacement blower is fed into air chamber
5 Porous diaphragm separates sand from air chamber
6 Sand is gently held in suspension with air passing around and through for best possible drying condition
7 Cone cover open, moisture laden air is driven out of sand chamber
8 Cone cover closed, air pressure increased sand moves from sand chamber into conveying tube
9 Sand is conveyed in tube vertically or horizontally to storage bin, shell molding or core machine

Ruggedly constructed, low in cost, no moving parts, maintenance free, the Chicopee Sand Dryer and Aerator is ideally suited for small, medium or large foundry operations. No additional manpower is needed and the results are worth the investment. Write today for further information.

WRITE TODAY for further information and prices

SHELL PROCESS, INC.

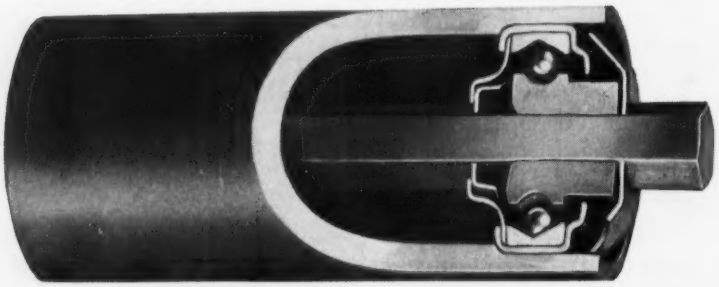
Manufacturers of Shell Molding Machinery and Allied Equipment

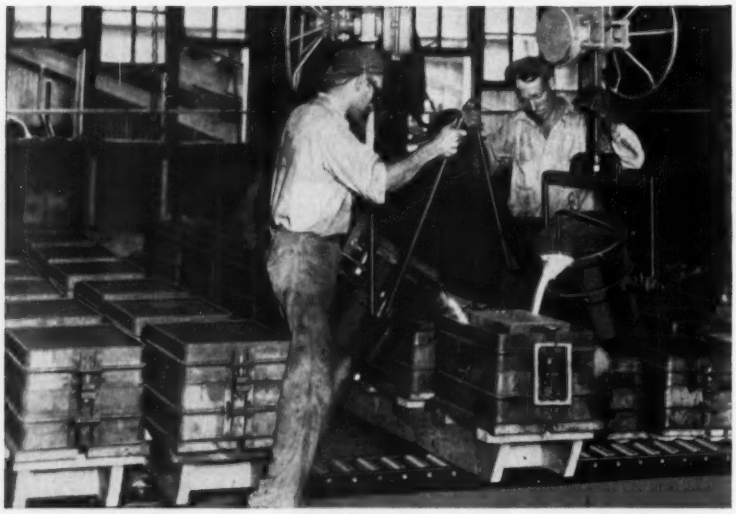
375 BLISS STREET, WEST SPRINGFIELD, MASS.

Circle 650 on Page 53

STANDARD'S SHIELDED BEARINGS

Grease-packed against dirt and corrosion—ideal for Foundry Conveyor Service





Move molds faster with less vibration and metal spillage on Standard roller conveyors — equipped with Standard's shielded, grease-packed bearings, protected against sand, dirt, and metal damage.

Standard's bearings are specially engineered for heavy duty foundry service . . . protective shielding keeps dirt from entering bearing. They are grease-packed at the factory for added protection and minimum maintenance. Provision made for regreasing to flush bearings.

Standard has been designing and manufacturing foundry conveyors since 1906 — a good reason why you can depend on Standard equipment to move foundry tonnage faster, safer, more profitably.

STANDARD CONVEYOR COMPANY
General Office: N. St. Paul 9, Minn.
Sales and Service in Principal Cities

Send for Standard's new, fully illustrated catalog, "Standard Conveyors Engineered for Faster Production" — a valuable reference book describing the many applications of Standard Conveyors for diversified industry. Address Dept. N-2.

Standard
GRAVITY & POWER
CONVEYORS

OVER 50 YEARS OF CONVEYOR EXPERIENCE

by individual occupants and also eliminate the problem of lost and misplaced locks.

Master-keyed locks should be selected if there will be a need to limit and control the nature or type of items that are kept in lockers. Pilferage of tools and small parts sometimes is reduced by providing company access to employees' lockers. Also, standards of neatness and sanitation can be maintained with master-keyed locks.

Flat-key locks of the master-keyed type also are available. They are recessed into the door to provide a flush surface.

Lockers can be equipped with flush type, automatic locks that take the place of handles. Locks of this kind are opened with a heavy-duty key.

Design Engineering Show to be Held in New York Coliseum

The Design Engineering Show, an exposition devoted to the research and development of new products, will be held in New York, May 23-26. More than 400 companies are expected to have exhibits at the show, which will occupy all four floors of the New York Coliseum.

At the same time, the machine design division of the American Society of Mechanical Engineers will sponsor its annual Design Engineering Conference at the Coliseum.

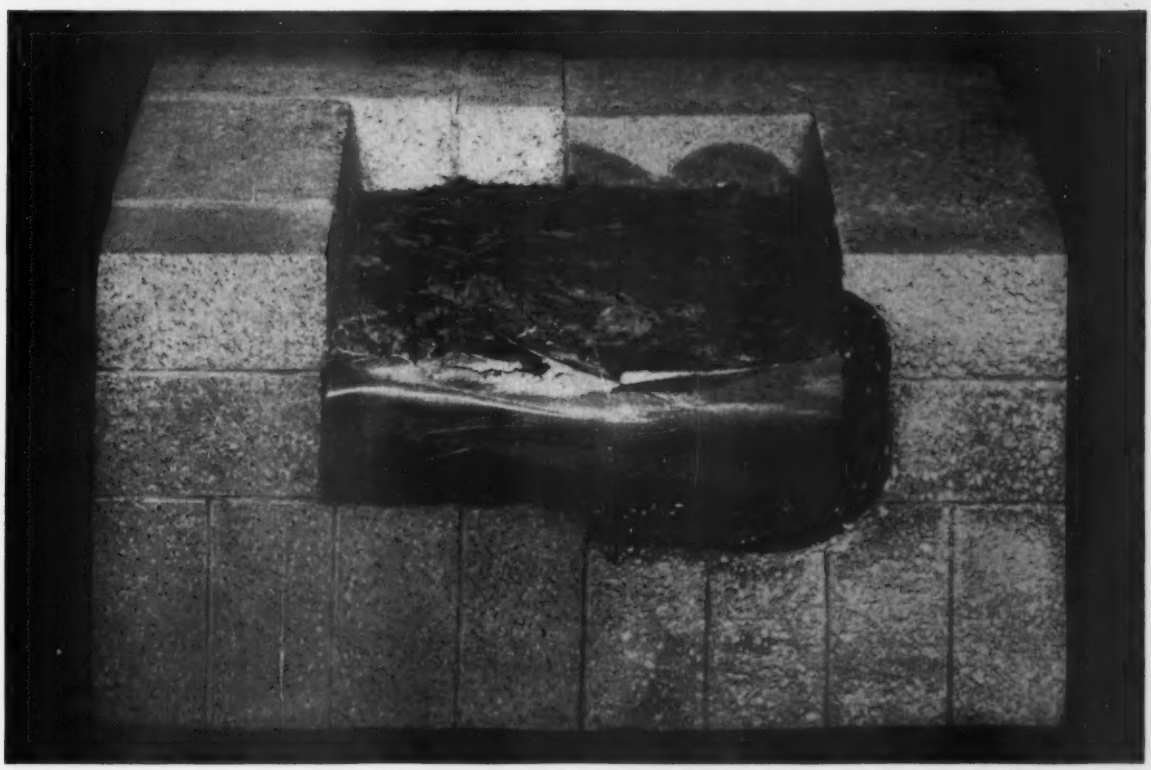
Materials and component parts for almost every type of product will be shown at the exposition. Clapp & Poliak Inc., 341 Madison Ave., New York 17, N. Y., are directors for the conference and show.

Grinding Wheel Safety Wall Chart Available

A wall chart listing ten dos and ten don'ts for grinding wheel operator safety is being offered by the Grinding Wheel Institute. These rules are based on regulations established by the American Standard Safety Code for the Use, Care, and Protection of Abrasive Wheels, B7.1-1956.

The chart is 13½ x 13½ in. and is available from the Grinding Wheel Institute, 2130 Keith Bldg., Cleveland 15, Ohio.

CORALITE 3-59 *shows superior resistance to molten aluminum.* In this photograph of a laboratory furnace hearth used for testing aluminum melting furnace refractories, the hearth has been cut in half to show relative resistance to penetration by molten aluminum. On the left is the Harbison-Walker CORALITE 3-59 laid with CORALBOND. On the right is a normal high-alumina brick laid with a widely used air-setting bonding mortar.



Unique refractories developed by HARBISON-WALKER fulfill fast growing needs for aluminum melting furnaces

Among H-W leading refractories developed specifically for modern aluminum melting practice, CORALITE 3-59 brand is particularly worthy of consideration. The unusual combination of physical and chemical properties of this refractory, most highly commend it for the wide diversity of intensified melting conditions.

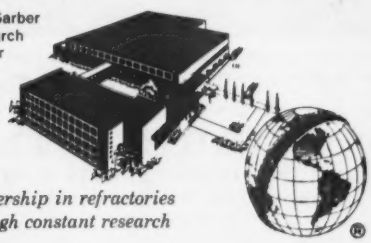
CORALITE 3-59 is a very hard burned brick containing approximately 85% alumina. It is made with a special bond (patent pending) which contributes to its remarkable strength and low permeability. Its transverse strength is three times that of strong fireclay brick. This is the significant criterion of its capacity for withstanding severe impact and abrasion.

SUPERIOR PROPERTIES OF CORALITE 3-59

- ***Resistance to*** penetration by molten metal at maximum working temperatures.
- ***Resistance to*** corrosion by aluminum alloys and various fluxes.
- ***Resistance to*** impact and abrasion accompanying charging of cold metal.
- ***Resistance to*** metal contamination resulting from chemical reaction.

CORALBOND is a phosphate bonded high-alumina mortar developed specifically for use in aluminum melting furnaces. Among numerous mortars of many compositions, CORALBOND is very outstanding in its resistance to penetration and corrosion by aluminum alloys at the furnace operating temperatures.

The Garber Research Center



Leadership in refractories through constant research

HARBISON-WALKER REFRACTORIES COMPANY

AND SUBSIDIARIES — GENERAL OFFICES: PITTSBURGH 22, PENNSYLVANIA

World's Most Complete Refractories Service

Circle 680 on Page 53

THE LITHIUM REACTOR

PERTINENT INFORMATION ON LITHIUM CHEMISTRY AND METALLURGY

L C A Acquires Fulton-Irgon

The Fulton-Irgon Corporation, a pioneer in propellants and rockets, was acquired recently by Lithium Corporation of America. This purchase will provide L C A with research and production abilities in the broad field of missiles, rockets and advanced aircraft systems. Continuing operation as the Fulton-Irgon Division, the new acquisition will enable L C A to provide better service to its present and potential customers since lithium chemicals and lithium alloys are already under active investigation in this field.

LITHIUM IN BRIEF

New developments involving lithium are constantly appearing in the literature. Each month some will be reported here. For further information, write our Sales Service Department.

Lithium, included in alloys for vapor coating with silver, prevents dark residue formation on vaporization filament. (1404).

Lithium is added to a self-flowing air-proof brazing alloy containing boron and based upon copper, nickel and palladium. (1238-9).

Old Art Serves Modern Industry

High conductivity copper, increasingly in demand by modern industry, is purified by a method pioneered almost 30 years ago by Osborg and Smith. These investigators demonstrated conclusively that lithium not only deoxidized ferrous and non-ferrous melts, but also performed a scavenging action and acted as a grain refiner of the cast metal.

To meet the needs of foundry men, L C A developed the "Lithium Cartridge," a cylinder of pure lithium metal encased in 99.9% copper, and hermetically sealed against deterioration. Because these new cartridges did not require material changes in ordinary foundry practice, nor specialized equipment for effective use, they won rapid acceptance wherever gas porosity, inclusions and poor grain structure in castings were a problem.

Lithium, properly applied in quantities of less than one part in ten thousand of melt, eliminates most of these imperfections. The smallest cartridge will treat 50 lbs of copper and the largest, 2400 lbs.

The two other sized cartridges make possible treatment of melts of all weights.

Aluminum Alloy Containing Lithium—New Advance for Supersonic Aircraft

Higher Thermal Barrier, Lighter Weight, Improved Modulus of Elasticity Characterize New Alloy

An exciting, high strength aluminum alloy containing lithium, called X2020, has been developed recently by research engineers at Aluminum Company of America. This new metal will maintain its high strength at temperatures up to 400 degrees F, surpassing the thermal barrier of former aluminum aircraft alloys of similar strength by about 100 degrees F. Jet-propelled ships traveling 1600 mph at operating altitudes develop "skin" temperatures of approximately 350 degrees F. Conventional aluminum aircraft alloys begin to lose their physical properties in the 250-350 degree F range encountered at speeds below 1300 mph. Presently under consideration for the Vigilante aircraft, X2020 is also expected to find applications in future forms of the B58 and other missiles and aircraft which fly at speeds which are prohibitive to the use of conventional aluminum alloys.

Another important feature of X2020 which makes it especially applicable for aircraft usage is its lighter weight.

ANNOUNCEMENT

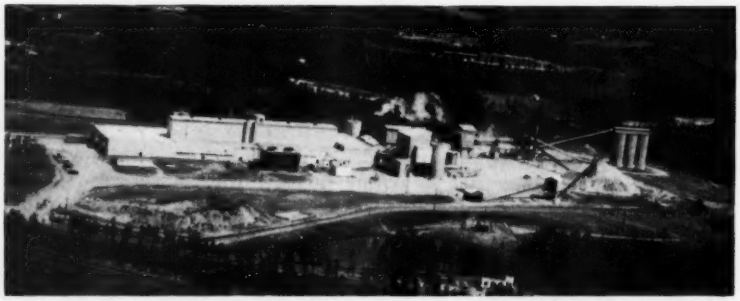
The uses of lithium in chemistry and metallurgy are expanding at a rapid rate. To bring you the news of the latest developments, Lithium Corporation of America will publish a new series of technical news bulletins of which this is the first. Additional copies of the LITHIUM REACTOR will be supplied regularly by mail to readers upon request.

For additional information on the items appearing in the LITHIUM REACTOR, address inquiries to: LITHIUM CORPORATION OF AMERICA, INC., Sales Service Department, Title Insurance Building, Minneapolis 1, Minn.

More than 3 per cent lighter than previously available aluminum alloys and lower in cost than commonly used high-temperature resistant metals, this new alloy will account for substantial reductions in total aircraft weight and cost. Modulus of elasticity, of prime importance in aircraft design, is improved 8 per cent by virtue of the lithium content of this material.

According to Alcoa, all mill products of the new alloy lend themselves to standard fabrication techniques employed by the aircraft industry. Presently available only in experimental quantities, X2020 is expected to be in full production by the time performance properties have been fully determined.

LITHIUM CORPORATION OF AMERICA BUILDING NEW LABORATORIES AT BESSEMER CITY



L C A's Bessemer City plant where centralized research facilities for the company are under construction. The new laboratories, expected to be completed early next summer, will house greatly expanded facilities and staff.

LITHIUM CORPORATION OF AMERICA, INC.

SALES SERVICE DEPARTMENT • TITLE INSURANCE BUILDING • MINNEAPOLIS 1, MINN.

NEW YORK 17, N. Y. • CLEVELAND 14, OHIO • CHICAGO, 1, ILL. • LOS ANGELES 36, CALIF. • BESSEMER CITY, N.C.

Literature for Foundrymen

For More Information Use Reply Card—Page 53

Shell Core Machines

Catalog includes a basic cover folder on the general features and methods of operation of shell core machines. Supplementary sheets describe individual models. Other literature gives detailed instructions and diagrams and lists parts.—**Dependable Shell Core Machines Inc.**, 1634 S.E. Seventh Ave., Portland 14, Oreg.

For More Details Circle No. 405—Page 53

Glove Selector

Glove selector includes a job condition checklist, to evaluate the specific problem of hand protection, and a slide selector chart which chooses the right glove for the problem. A performance data chart is included. This chart lists several chemicals and the reaction of glove materials to the chemicals.—**Pioneer Rubber Co.**, 296 Tiffin Rd., Willard, Ohio.

For More Details Circle No. 406—Page 53

Products for Tooling

Eight-page "Industrial Application Bulletin #2" describes and illustrates how several different manufacturers have solved problems in making jigs, fixtures, metal forming dies, duplicating masters, and other tools by using the company's products.—**Devcon Corp.**, Endicott Street, Danvers, Mass.

For More Details Circle No. 407—Page 53

Blast Cleaning Barrels

Features of the standard duty line of Rotoblast cleaning barrels from 1½ to 18-cu ft capacity are described in Bulletin 706. Complete dimensions and specifications are given for each barrel, showing how each can be fitted to certain requirements. Also described and illustrated is the abrasive impeller.—**Pangborn Corp.**, Hagerstown, Md.

For More Details Circle No. 408—Page 53

Ferrous Metallurgy Guide

"Basic Guide to Ferrous Metallurgy" shows principal characteristics of steels with carbon content ranging to 0.9 per cent. Important working zones are illustrated on the diagram. Materials for temperature indicating are illustrated on the back of the chart.—**Tempil Corp.**, 132 W. 22nd St., New York 11, N. Y.

For More Details Circle No. 409—Page 53

Photoelectric Control

Bulletin GEA-6822 describes the company's full line of controls for industrial counting, sorting, signaling, protecting, diverting, detecting, or limiting jobs. It illustrates how these devices can be applied to simplify systems, reduce labor, and cut waste while increasing the speed of the operation.—**General Electric Co.**, Schenectady 5, N. Y.

For More Details Circle No. 410—Page 53

Pendent Switch

Four and six-station models of pendent safe switch are illustrated and discussed in Bulletin F49A.—**Joy Mfg. Co., Electrical Products Div.**, 1201 Macklind Ave., St. Louis 10, Mo.

For More Details Circle No. 411—Page 53

X-Ray Units

Adaptability, construction, and safety of Fedrex x-ray units are covered in this bulletin. Specifications are included.—**Princeton Div., Curtiss-Wright Corp.**, P. O. Box 110, Princeton, N. J.

For More Details Circle No. 412—Page 53

Thermocouple and Indicator

Data sheets offer information on portable molten metal thermocouple and indicator. Illustrations of applications of the equipment and a sample quotation are included.—**Leeds & Northrup Co.**, 4907 Stenton Ave., Philadelphia 44, Pa.

For More Details Circle No. 413—Page 53

Pipe Thread Fittings

Folder on pipe thread fittings illustrates possible applications of the fittings and gives prices, dimensional data, and lists of users and sales offices.—**Tru-Seal Div., Flick-Reedy Corp.**, York and Thorndale Roads, Bensenville, Ill.

For More Details Circle No. 414—Page 53

Did You Miss These?

Here is a list of popular literature items offered in recent months:

MANGANESE IN CAST IRON—Ohio Ferro-Alloys Corp., Canton 9, Ohio. Circle 401, Page 53.

CRUCIBLE MELTING — Crucible Manufacturers Association, New York 36, N. Y. Circle 402, Page 53.

REFRACTORIES (Vol. 4, No. 2, *Refractories by Carborundum*)—Refractories Div., Carborundum Co., Perth Amboy, N. J. Circle 403, Page 53.

EMPLOYEE INCENTIVE PLANS (D. R. Pohlman paper)—Eddy-Rucker-Nickels Co., Harvard Square, Cambridge 38, Mass. Circle 404, Page 53.

Vacuum-Pressure Impregnators

High vacuum and pressure impregnators are outlined in Bulletin 4001. Three models are illustrated.—**Metallizing Co. of America**, 3520 W. Carroll Ave., Chicago 24, Ill.

For More Details Circle No. 415—Page 53

Variable-Speed Pulleys

MS line of variable-speed pulleys is described in Bulletin 4101. The 12-page bulletin includes technical data on five models.—**T. B. Wood's Sons Co.**, Chambersburg, Pa.

For More Details Circle No. 416—Page 53

Cylinders

Twenty-four page bulletin 91017 describes air, water, and oil cylinders and valve-cylinder combinations. Specifications, ordering information, and features are discussed.—**Airmatic Valve Inc.**, 7317 Associate Ave., Cleveland 9, Ohio.

For More Details Circle No. 417—Page 53

Tractor Crane

Bulletins MH-100 and MH-200 offer description, illustrations, and specifications on the Go-Devil tractor crane.—**Drott Mfg. Corp., Materials Handling Div.**, Wausau, Wis.

For More Details Circle No. 418—Page 53

Conveyor Lubricators

Catalog CL659 describes and illustrates automatic conveyor lubricators, including diagrams of parts.—**J. N. Fauver Co. Inc.**, 51 W. Hancock Ave., Detroit 1, Mich.

For More Details Circle No. 419—Page 53

Electrification Systems

Bulletin 76 gives features of crane and hoist electrification systems. Illustrations are included to show use of the systems in various installations.—**Feedrail Corp.**, 125 Barclay St., New York 7, N. Y.

For More Details Circle No. 420—Page 53

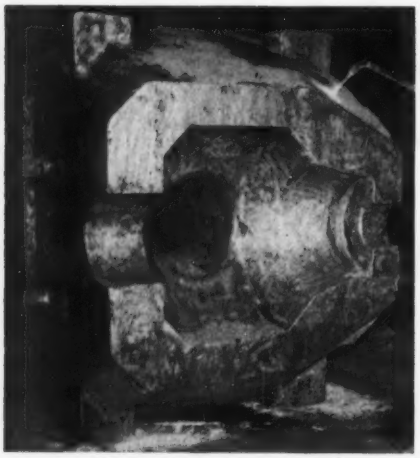
Flooring Guide

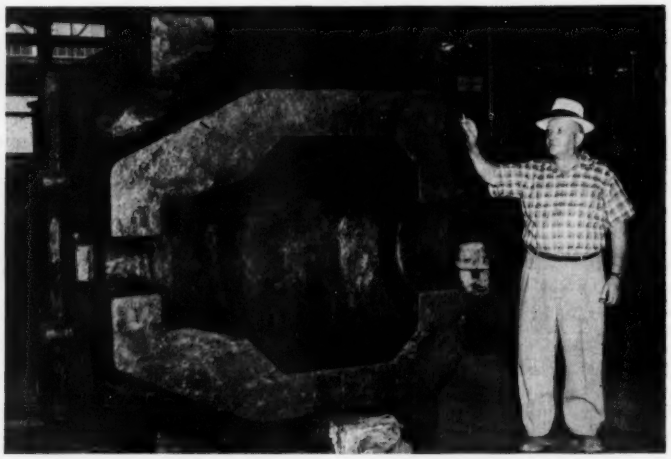
Manual describes products for maintenance and repair of interior and exterior floors.—**Flooring Div., Monroe Co. Inc.**, 10703 Quebec Ave., Cleveland 6, Ohio.

For More Details Circle No. 421—Page 53

Speed Reducers

Detailed engineering data on shaft-mounted speed reducers are contained in Booklet J-19. Booklet J-18 contains simi-





Steel Foundry Produces
LARGE PRESS DIES

By HARRY YOUNG
General Superintendent, Melt Shop
Cameron Iron Works Inc.
Houston, Tex.

Pictured here are two halves of a press die set cast at the Cameron Iron Works Inc. steel foundry in Houston, Tex.

Cameron installed its captive foundry in the summer of 1958 with the production of press dies as the primary objective. Since that time a wide variety of die parts has been produced varying in weight from 8000 to 40,000 lb net.

J. P. Solomon (pictured above with the castings), who has been in charge of the Cameron Foundry since its inception, has developed molding techniques and sand formulas which maintain exceptional dimensional tolerances and surface finish. John Bridges, melt shop superintendent, also has been instrumental in the development of the production practices.

The consistent production of castings with these qualities has allowed Cameron to eliminate a great deal of time consuming machining in the production of finished die sets. It is standard practice to machine only the top and bottom faces and such areas that guide moving parts. The cavity is touched up by hand grinding, which is usually sufficient for the production of most forgings.

The material used in these castings is generally a modified 4100 series steel, designed to resist heat checking and to harden sufficiently to resist upsetting under high compressive loads. The steel is produced in basic electric furnaces under the same conditions and controls by which Cameron produces its high quality forging steels.

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lar data for in-line and right-angle helical speed reducers. Each booklet gives 24 pages of rating tables, selection procedures, and other technical information.—**Hewitt-Robins Inc.**, 666 Glenbrook Rd., Stamford, Conn.

For More Details Circle No. 422—Page 53

Industrial Trucks

Details of industrial trucks are given in Bulletin 59. Information is included on electric and gas fork trucks, platform trucks, and crane trucks.—**Baker Industrial Trucks**, division of Otis Elevator Co., 8000 Baker Ave. N.W., Cleveland 2, Ohio.

For More Details Circle No. 423—Page 53

Fabric Work Gloves

Basic types of coated fabric work gloves for industrial use are illustrated and described in Bulletin 1315-1. Specific industrial applications and chemical resistance evaluation of glove materials also are provided.—**Mine Safety Appliances Co.**, 201 N. Braddock Ave., Pittsburgh 8, Pa.

For More Details Circle No. 424—Page 53

Disposable Odor Filter

Bulletin 220 gives features of activated carbon disposable odor filter. Engineering data are included.—**American Air Filter Co. Inc.**, 215 Central Ave., Louisville 8, Ky.

For More Details Circle No. 425—Page 53

Annunciator

Features of the Fail-Safe annunciator are outlined in Bulletin 108. Dimensions also are given.—**Panalarm Div., Panellit Inc.**, 7401 N. Hamlin Ave., Skokie, Ill.

For More Details Circle No. 426—Page 53

Magnetic Particle Inspection

Thirty-six page booklet describes wet magnetic particle inspection using Immunol 438 as the water phase vehicle. Case histories are included in the evaluation.—**Harry Miller Corp.**, Fourth and Bristol Streets, Philadelphia 40, Pa.

For More Details Circle No. 427—Page 53

Coolers and Dryers

Thirty-page book covers electric and mechanical vibrating type coolers and dryers, both direct and indirect. Catalog 953 also includes accessories and an outline of the pilot unit rental system.—**Jeffrey Mfg. Co.**, P. O. Box 1879, Columbus 16, Ohio.

For More Details Circle No. 428—Page 53

Micrometers

Precision motorized and manually operated deadweight micrometers for measuring paper, film, foil, and rubber sheet materials, are outlined and illustrated in brochures which also cover special purpose instruments for internal and external measurements of molded pieces and

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Circle 654 on Page 53

castings. Twenty-four methods of solving difficult measuring problems are illustrated.—**Testing Machines Inc.**, 72 Jericho Turnpike, Mineola, N. Y.

For More Details Circle No. 429—Page 53

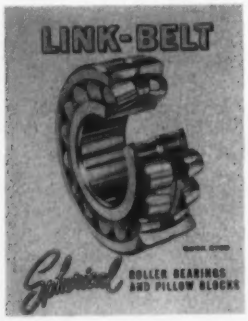
Pneumatic Equipment

Fact File ER-G-6 gives case histories illustrating use of pneumatic equipment in material handling. Photographs show equipment in operation.—**Fuller Co.**, Fuller Bldg., Catasauqua, Pa.

For More Details Circle No. 430—Page 53

Spherical Roller Bearings

Book 2760 covers all design features of spherical roller bearings including comprehensive selection data and formulas,



shaft bearing seat diameters, lubrication information, shaft details and bearing load ratings, diagrams, photographs, and charts.—**Link-Belt Co.**, Dept. PR, Prudential Plaza, Chicago 1, Ill.

For More Details Circle No. 431—Page 53

Ferroalloys

"Vancoram Products" catalogs metals and ferroalloys for foundry use. Booklet also describes composition and applications of the products.—**Vanadium Corp. of America**, 420 Lexington Ave., New York 17, N. Y.

For More Details Circle No. 432—Page 53

Hoist Specifications

Booklet 200 is second in a series of publications on recommended minimum standard specifications. This booklet is concerned with hand-operated hoists.—**Hoist Manufacturers Association Inc.**, One Thomas Circle, Washington 5, D. C.

For More Details Circle No. 433—Page 53

Conductor Systems

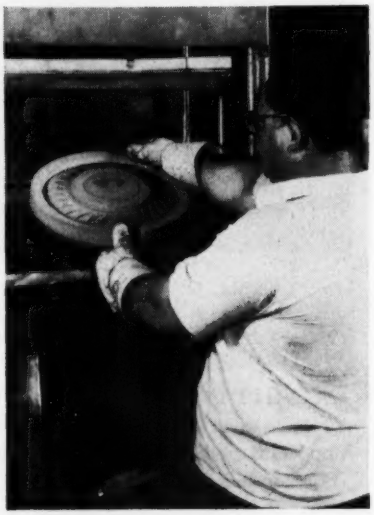
Bulletin 2016-D describes and illustrates Safpowrbar conductor systems for providing electrification on overhead materials handling equipment.—**Cleveland Tramrail Div., Cleveland Crane & Engineering Co.**, E. 289th Street, Wickliffe, Ohio.

For More Details Circle No. 434—Page 53

Pyrometers

Catalog C93-1a offers complete description of the theory and fundamentals of radiation pyrometry. Catalog includes de-

"Can't make these molds with any other resin," says foundry president



MUCH FASTER THAN PLASTER. In place of conventional plaster for vaned aluminum parts, foundrymen at Harris employ shell molds using Durez resin. They get molds in minutes instead of days.

Look at the vanes in this fluid-coupling part and you'll see why it is a tough one to cast in aluminum.

"Only one shell-mold resin—a Durez resin—gives us satisfactory release in this application," says George Harris, president of Harris Metals Treating Co., Racine, Wisconsin.

From days to minutes. In the vanes is where tolerances are smallest. This type of casting is generally made in plaster—a time-consuming operation.

To hold cost down, Harris foundrymen decided right from the start to use shell molds. Result: they're making molds in minutes instead of days—with accuracy and finish right up to par.

Why shell is good insurance. Customers like the savings they make on machining—with the smooth,

FOUNDRY WHIPS RELEASE PROBLEM. On these vaned aluminum castings, Harris Metals Treating Co. gets good results with a Durez shell-mold resin—the only one that works.

accurate castings that shell molding and coring make possible. Foundries everywhere are finding shell a powerful advantage in getting and holding business against competitive bids.

Why you're ahead with Durez. Every year more foundrymen discover they get more of the advantages of shell molds and shell cores—and *fewer* of the problems—with Durez foundry resins.

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Circle 655 on Page 53

scriptions of pyrometers. — **Minneapolis-Honeywell Regulator Co., Industrial Div.**, Wayne and Windrim Avenues, Philadelphia 44, Pa.

For More Details Circle No. 435—Page 53

Grinding Wheels

Bulletin F-80 contains illustrations, information, and price data on grinding wheels.—**Chicago Wheel & Mfg. Co.**, 1101 W. Monroe St., Chicago 7, Ill.

For More Details Circle No. 436—Page 53

Gyratory Foundry Riddles

Bulletin and price list describe and illustrate gyratory foundry riddles.—**Great Western Mfg. Co.**, Box 813, Leavenworth, Kans.

For More Details Circle No. 437—Page 53

Vibration Inducers

Thirty-eight page catalog provides engineering data, specifications, and a price list on the Vibrolator line of vibration inducers.—**Martin Engineering Co.**, Neponset, Ill.

For More Details Circle No. 438—Page 53

Detachable Couplers

Twenty-page catalog gives facts and figures on automatic, semiautomatic, and

regular quick-detachable couplers. File contains information on chrome sleeve fittings of all types, including uses for each fitting.—**Foster Mfg. Co. Inc.**, Dept. 21, 2850 Gravois, St. Louis 18, Mo.

For More Details Circle No. 439—Page 53

Gas Welding Rods

Bulletin DH-1277-B gives information about gas welding rods. Analysis of the rod, recommended uses, welding procedure, and physical properties also are covered in the 8-page bulletin.—**Page Steel & Wire Div., American Chain & Cable Co. Inc.**, Monessen, Pa.

For More Details Circle No. 440—Page 53

Magnetic Parts Separators

Two models of magnetic parts separators are described and illustrated in Bulletin 110-B. Special parts separators are shown.—**Stearns Magnetic Products**, division of Indiana Steel Products Co., 635 S. 28th St., Milwaukee 46, Wis.

For More Details Circle No. 441—Page 53

New Books for Foundrymen . . .

ENGINEERING

Foundry Engineering, by Howard F. Taylor, Merton C. Flemings, and John Wolf, cloth, 407 pages 5¾ x 8⅝ in., published by John Wiley & Sons Inc., 440 Fourth Ave., New York 16. Price $9.75.

In an industry which has progressed from an art to a science, the need exists for a textbook "concerned with the basic engineering aspects of the materials and methods involved in making castings." This book fills that need. As the authors point out, it is not a reference book, but a simplified and comprehensive engineering description of the foundry and of founding, presented in a straightforward teachable fashion. The authors are well known in the foundry industry, and are members of the staff of the Department of Metallurgy, Massachusetts Institute of Technology.

A listing of the chapter headings gives some indication of the breadth of the work. Subject matter is presented under the following headings: Introduction to casting process; sand casting; other cast processes, nature of cast metals; solidification; risering; gating; the ingot as a casting; casting defects, cleaning, inspection and repair; pattern construction and casting design; storage, handling, preparation and reclamation of sands; melting; refractories; and heat treatment and joining of cast metals.

While prepared chiefly for the teaching of students at the college level, the authors believe it can be adapted to use in high schools as well. Furthermore, this text can be of great help in training programs within plants.

Special mention should be made of the excellent illustrations, drawn by George E. Schmidt Jr., also of the MIT staff. These drawings are exceptionally well done and add much to the clarity of the publication.

TESTING

Nondestructive Testing Handbook, edited by Robert C. McMaster, 2 volumes, published by the Ronald Press Co., 15 E. 26th St., New York 10, N. Y. Price $24.

Experience acquired throughout industry in selecting, applying, and interpreting tests designed to improve equipment performance, cut costs, insure quality, and reduce breakdowns is integrated in this handbook. It emphasizes test techniques, principles, equipment, suitability, and interpretation.

The handbook includes many charts, drawings, forms, photo-

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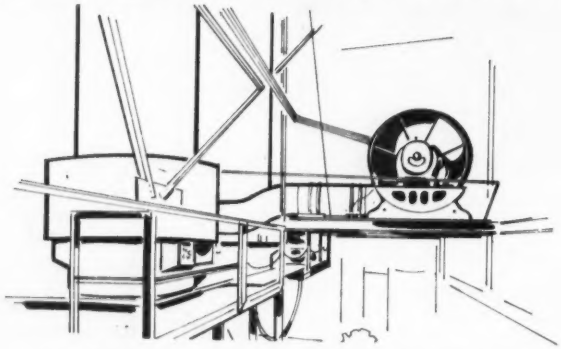

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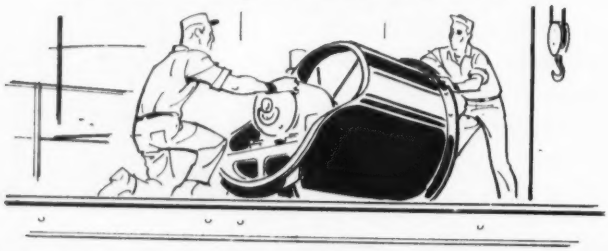

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graphs, graphs, and tables which offer guidance for every organizational level. Many of the data are available for the first time, particularly in advanced fields such as penetrating radiation, magnetic field, eddy current, and ultrasonic testing. The contents include 54 sections with 1200 illustrations.

STEELMAKING

Steelmaking for Steelmakers, by A. Jackson, cloth, 265 pages, 6 x 9 in., published by the United Steel Companies, 17 Westbourne Rd., Sheffield 10, England. Price $6.

The material in this volume originally was presented in lectures before evening school students and technical societies in England. Later the contents of the book was published as a series of articles in *Man and Metal,* the journal of the Iron and Steel Trades Confederation. The material was prepared for melters and all of those who actually help them do their jobs.

The text deals with refractories, instruments and instrumentation, fuels, efficient combustion, chemistry of steelmaking, and the various factors in the steelmaking practice. The final chapter deals with the use of the oxygen refining process.

FATIGUE

Symposium on the Basic Mechanisms of Fatigue, hard cover, 128 pages, 6 x 9 in., published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3. Price $3.75.

Six papers in this symposium clarify some of the mechanisms of fatigue failure such as dislocations, internal friction, crystalline and structural changes, and surface disintegrations. Various areas of observational levels are touched on in discussing the mechanisms of failure. The papers also emphasize the statistical nature of material behavior under cyclic loadings.

EXHAUST SYSTEMS

Design of Industrial Exhaust Systems, by John L. Alden, Cloth, 245 pages, 6 x 9 in., published by the Industrial Press, 93 Worth St., New York 18. Price $6.

This is the third edition of a reference text which covers such subjects as fluid flow, hoods, dust system design, dust separators, pneumatic conveyors, fans, system detail and planning, field measurements and their interpretation. Special mention is made of foundry shakeout ventilation.

PERSONNEL

The Personnel Function: A Progress Report, 139 pages 6 x 9 in., Management Report 24, published by the American Management Association, 1515 Broadway, New York 36. Price $3.75.

This report is based on material presented at the 1958 fall personnel conference of AMA. It deals with ways of applying the scientific method in personnel work, of charting the course of personnel administration, and of improving employment relationships. It also reviews recent data on compensation, appraisal, and labor-management relations. The final section deals with the handling of problem employees.

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Men of Industry

J. ROSS DREVER

GOFF SMITH

. . . American Steel Foundries promotions

C. A. CRAWFORD

. . . technical director, ICI

JOHN F. OETTINGER

. . . Pacific Alloy works mgr.

J. Ross Drever has been elected president, Griffin Wheel Co., Chicago, and Griffin Steel Foundries Ltd., St. Hyacinthe, Que. He succeeds **Goff Smith**, who has been named vice president, American Steel Foundries, Chicago, the parent company. Mr. Smith joined the ASF sales department in 1946. In 1955 he was elected executive vice president of Griffin, later becoming president. Mr. Drever was Griffin's director of research from 1953 until 1955 when he was named vice president. **Lester T. Moate**, controller-treasurer, American Steel Foundries, has been named vice president and treasurer. **William V. Covert**, assistant vice president, has been made vice president. **Russell E. Larsen** has been elected controller, and **James L. Green**, assistant controller. **Robert H. Wellington** and **C. Fred Strom** were elected vice presidents, Griffin Wheel Co.

Ernest E. Zimmerman, formerly assistant superintendent and metallurgist, Electrocast Steel Foundry Co., Cicero, Ill., has been appointed general superintendent, Iowa Malleable Iron Co., Fairfield, Iowa.

Howard Voight has been elected president, Stedman Foundry & Machine Co., Aurora, Ind., subsidiary of United Engineering & Foundry Co., Pittsburgh. He has been with United for 30 years, recently as a sales engineer.

C. A. Crawford has been appointed technical director of the Investment Casting Institute, Chicago. He will supervise and co-ordinate technical programs, including work in research, and in development of metal specifications and other standards. A graduate of Massachusetts Institute of Technology, his background includes research work with American Sheet & Tin Plate Co., subsidiary of U. S. Steel Corp. From 1920 until his recent retirement he was with the International Nickel Co., serving principally with its Development and Research Div.

Dr. Augustus B. Kinzel, vice president of research, Union Carbide & Carbon Corp., New York, has been named recipient of the Industrial Research Institute Medal for 1960, to be awarded at the institute's annual meeting in May. Dr. Kinzel's research contributions cover activities in the fields of metallurgy, industrial gases, and atomic energy.

Peter Gianaris has been appointed manager of materials for the Everett Foundries, General Electric Co.'s Foundry Department, Everett, Mass. Since he joined the company in 1951 he has been engaged in wage rate and planning programs.

S. C. Trager has been appointed distribution manager, Pure Carbonic Co., Div. of Air Reduction Co., New York. He has been assistant to the vice president of distribution.

John F. Oettinger, projects engineer, Electric Steel Foundry Co., Portland, Oreg., has been named works manager at its subsidiary, Pacific Alloy Corp., El Cajon, Calif. He joined the parent company in 1949. Mr. Oettinger is active in committee work of the Steel Founders' Society of America, and is vice chairman of the Oregon Chapter of the American Foundrymen's Society.

William H. Schweikert, formerly with Aircraft Gas Turbine Div., General Electric Co., Cincinnati, has joined Precision Castparts Corp., Portland, Oreg., as technical director.

John Weaver has been appointed director of customer relations, Mercast Mfg. Corp., LaVerne, Calif., succeeding **Michael Gladstone**, who has resigned. Mr. Weaver joined the company in January.

Gerald Lewis has been named director of product engineering, Cooper Alloy Corp., Hillside, N. J., succeeding **William C. Hookway Jr.**, resigned. **Stuart F. Cooper** becomes sales manager, Vanton Pump & Equipment Div., Mr. Lewis' former position. **Harold W. Rimalover** has been assigned to Mr. Cooper's former duties as sales manager, Foundry Products Div. **William G. Crook Jr.** and **Harold G. Haucke** have been named sales en-

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PHILIP F. GRAY JR. | THOMAS R. ELMBLAD | J. A. McGLONE | B. L. HEINEN | R. A. ROGERS

. . . Whiting Corp. appointments

gineers for Foundry Products Div. in New England and Philadelphia, respectively.

Philip F. Gray Jr. has been named Boston district manager, and **Thomas R. Elmblad,** Cleveland district manager, Whiting Corp., Harvey, Ill. Mr. Gray has been in the New York sales office, and Mr. Elmblad, the Pittsburgh office. **J. A. McGlone,** Chicago sales, has been appointed sales manager of overhead material handling systems, at Harvey. **B. L. Heinen,** Houston office, has been transferred to the Chicago sales office. **R. A. Rogers** has moved from Chicago to the Charlotte, N. C., office.

Rawson L. Wood has been named chairman of the board, **William I. Matthes** president, and **William O. Sweeny** executive vice president, of Arwood Corp., New York. The company was formed with the recent merger of Arwood Precision Casting Corp., New York, Mercast Mfg. Corp., LaVerne, Calif., and its subsidiary, Alloy Precision Castings Co., Cleveland. Mr. Wood was founder and former president, Mr. Matthes executive vice president, and Mr. Sweeny vice president in charge of sales, of Arwood Precision Casting Corp.

Russel T. Drennan has been appointed director of sales, and **Eugene C. Tinsley,** director of marketing, Kaiser Refractories & Chemicals Div., Kaiser Aluminum & Chemical Corp., Oakland, Calif. Mr. Drennan formerly was general sales manager for Kaiser Chemicals. Mr. Tinsley was vice president and director, Mexico Refractories, Mexico, Mo., prior to the recent merger of the two companies.

Anthony B. Ascik has been appointed director of metallurgical technical services, Tennessee Products & Chemical Corp., Nashville, Tenn. Until recently he was technical director, Pittsburgh Metallurgical Co., Niagara Falls, N. Y.

Halle P. Robb has been named manager of sales in northern California, Nevada and Utah for Electric Steel Foundry Co., Portland, Oreg. He will continue as manager of Pacific area sales for the company's International Div. **W. R. Rice** has been made manager of mill products sales in the San Francisco Bay area. **Don Erickson** returns as manager of the San Francisco office. **Karl Moore,** who has been acting manager there, has become a sales representative.

William H. Dotter has been named marketing representative in charge of internal and external sales at the Everett, Mass., foundry, General Electric Co. He has been manager of materials there. **Walter L. Bardeen,** formerly a pattern and castings planner at the company's Elmira, N. Y., foundry, has been made marketing representative of internal sales there, replacing **S. J. Updyke,** who has been assigned to external sales.

Robert T. Howard has joined Chromium Mining & Smelting Corp., Chicago, as director of its new technical department. Until recently a technical consultant, Mr. Howard was formerly with Vanadi-

RAWSON L. WOOD | WILLIAM O. SWEENY | WILLIAM I. MATTHES | ROBERT T. HOWARD

. . . Arwood Corp. executives | *. . . becomes technical director*

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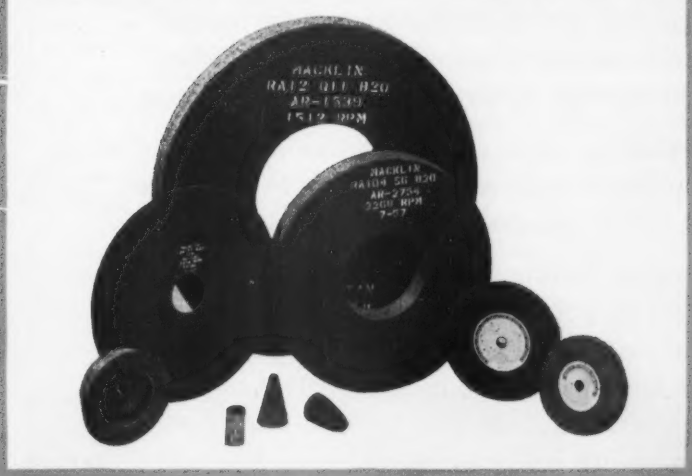

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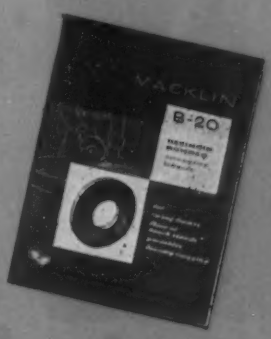

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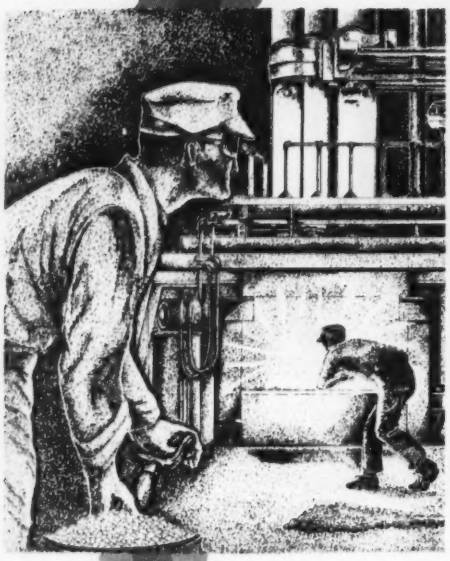


AN IMPORTANT MESSAGE FOR ELECTRIC STEEL FURNACE OPERATORS

The performance requirements of graphite in nuclear and space age applications are spurring advances in graphite technology that were unheard of a few short years ago.

Research and development progress attributable to these newer graphite uses is rapidly adding to the fund of technical knowledge of graphite's unique properties, and to increasingly tighter controls in its manufacture.

GLC graphite is now employed in many of today's new applications such as nuclear moderators, missiles, rockets, honeycomb steel brazing and so on.

Users of GLC electrodes in electric steel furnaces can be sure that GLC graphite specialists are making significant contributions in these advanced technological areas—and that their findings are being translated into improvements in GLC electrode columns and superior customer service.

We welcome opportunities to assist you in lowering electrode costs per melt ton.

PRODUCTS ELECTRODE GLC DIVISION YOU CAN TRUST

GREAT LAKES CARBON CORPORATION

18 EAST 48TH STREET, NEW YORK 17, N. Y. OFFICES IN PRINCIPAL CITIES

Circle 660 on Page 53

DANIEL R. CHESTER

VICTOR M. ROWELL
Archer-Daniels-Midland appointments

JOHN M. SWEENEY

JOHN R. ANDERSON
. . . West Coast regional sales

um Corp. of America, New York, and Pittsburgh Metallurgical Corp., Niagara Falls, N. Y.

Victor M. Rowell has been named manager of product development, **Daniel R. Chester**, manager, products and services, and **John M. Sweeney**, technical service manager, Federal Foundry Supply Div., Archer-Daniels-Midland Co., Cleveland. Mr. Rowell, who was an A-D-M product manager before he joined Harry W. Dietert Co., Detroit, in 1955, will supervise and co-ordinate development of new binders and facings. Mr. Chester previously was manager of A-D-M's core binder department, and Mr. Sweeney was manager of the facings department.

Maurice V. H. Dann has joined Wisconsin Centrifugal Foundry Inc., Waukesha, Wis., as foundry engineer. He was formerly foundry consultant and assistant forge and foundry engineer, Athens Foundry Corp., Athens, Pa., subsidiary of Ingersoll-Rand Co., New York.

Robert Cushman has been appointed general sales manager of the Abrasive Div., Norton Co., Worcester, Mass. **W. Alex McCune** succeeds Mr. Cushman as sales manager of grinding wheels. **William A. Russell** has been assigned Mr. McCune's former duties as manager of field sales, grinding wheels. **David H. Paul**, abrasive engineer in the Baltimore area, has been named Detroit district manager, Mr. Russell's former position. **Harlan T. Pierpont** has been made sales manager of abrasives, succeeding **George A. Park**, who has retired after 50 years with Norton. Mr. Pierpont was sales manager of the Electro-Chemical Div.

Charles E. Drury has been appointed to a new position, divisional director of reliability, Central Foundry Div., General Motors Corp., Saginaw, Mich. **Thomas E. Smith** has succeeded Mr. Drury as manager of the division's Danville, Ill., plant. **Dale W. Wonus** has been assigned Mr. Smith's former duties as production manager at Danville. Mr. Drury was manufacturing superintendent of the Danville plant until 1951, when he was transferred to the Saginaw Malleable Iron Plant as factory manager. He returned to Danville as plant manager in 1956. Mr. Smith previously served as factory manager and general superintendent at Danville. Mr. Wonus was superintendent of the gray iron foundry and finishing department at Danville prior to being placed on special assignment to Mr. Smith last year.

John R. Anderson has been appointed regional abrasive specialist, Bay State Abrasive Products Co., Westboro, Mass., with headquarters at the company's new office in Long Beach, Calif. His territory has been expanded to cover the entire West Coast area.

H. M. Patton, works manager, and **K. F. Potter**, director of engineering, have been elected vice presidents, American Hoist & Der-

MAURICE V. H. DANN
. . . joins Wisconsin Centrifugal

CHARLES E. DRURY

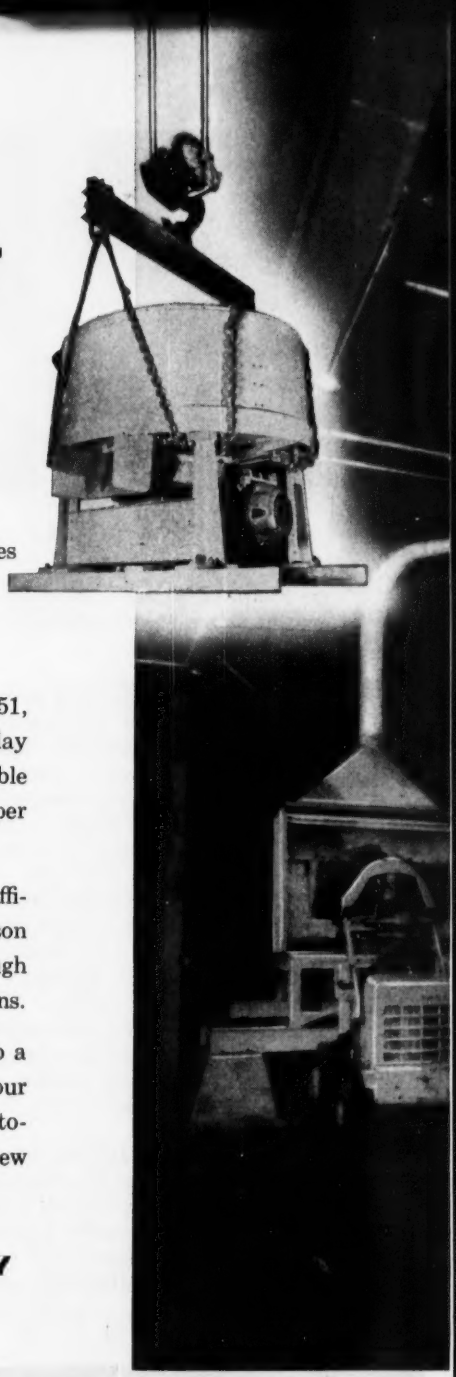
DALE W. WONUS

THOMAS E. SMITH

. . . appointments at Central Foundry Div., GMC

Would you TRADE IN your present Simpson Mixer for increased foundry profits?

How the Mix-Muller retirement plan benefits Mix-Muller users



Do you own a Simpson mixer comparable to the one described in the tables below? If you do . . . you may be pretty satisfied with your lot. Here's a dependable old machine still turning out production 10, 15, maybe even 20 years after you "wrote off" your investment.

Now, good National customers are *never* wrong. But . . . on June 5, 1951, that machine started to *owe* you money—production dollars. On that day nine years ago, the *Model F* Series Simpson Mix-Muller was made available to offer you 67% greater batch capacity . . . 100% more production per hour . . . 30% more overall mulling efficiency.

Whether you want increased production or greater sand preparation efficiency, these figures mean that every dollar you spend on a new Simpson Mix-Muller is an *investment* which you can expect *returned* to you through more profitable . . . up to 50% more profitable . . . sand preparing operations.

What's more—in 1960 National is prepared to make your transition to a modern F Series Mix-Muller as easy and as economical as possible. If your Simpson was built before 1951, you can *trade it in*—as you would your automobile. Why not call your National agent or write for details on the new *Mix-Muller retirement plan?*

NATIONAL ENGINEERING COMPANY
646 Machinery Hall Bldg., Chicago 6, Illinois
In Canada: 17 Queen St., East, Toronto 1

TRADE UP for increased Foundry Profits

IF YOUR SIMPSON MIXER IS OVER 20 YEARS OLD A MODERN F SERIES MIX-MULLER CAN DELIVER:

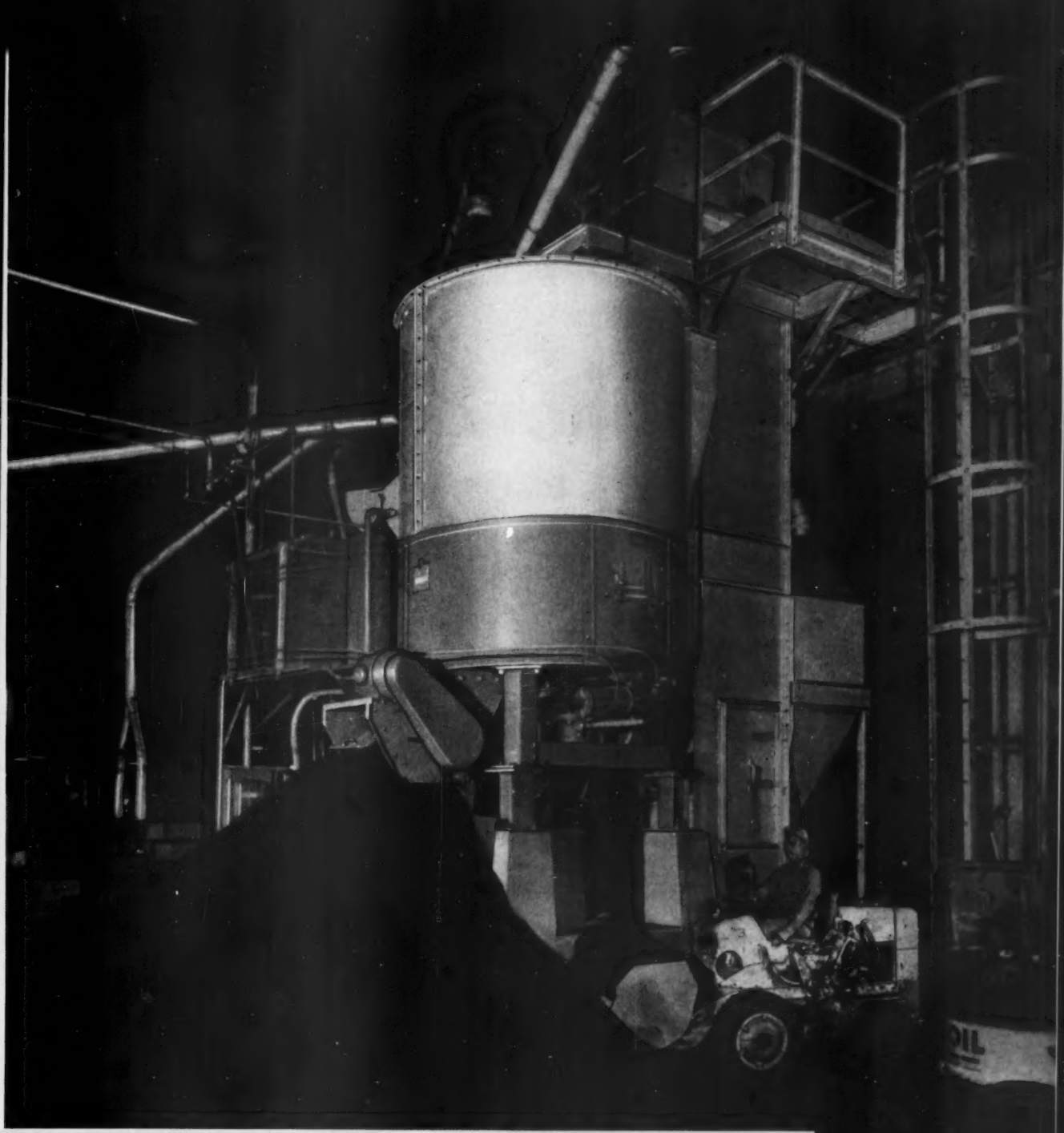
- 67% greater Batch Capacity
- 100% more Hourly Production
- 30% more Mulling Efficiency

THE FOUNDRYMAN'S CHOICE BY 4 TO 1

PERFORMANCE

	1930 Simpson	Model F Mix-Muller	
Batch Capacity	1200 lbs. (max.)	2000 lbs. (min.)	67% more
Output Per Hour (G.I. Mold.)	12 tons (max.)	24 tons (min.)	100% more
Discharge Time	40 seconds	20 seconds	50% less
Mulling Efficiency	On basis of time required to develop sand characteristics compatible with modern foundry practice overall 2F efficiency is about . . .		30% greater
Equipment Cost (Per Ton/hr. of Sand Prepared)	Based on present day prices, the 2F Mix-Muller will turn out 100% more sand per hour at an equipment investment amounting to . . .		31% less cost per ton./hr.

MORE PRODUCTION



F280

CONSTRUCTION:

	1930 Simpson	Model F Mix-Muller
Muller Suspension	Rocker arms. 3 weights of mullers 700, 1000, 1600 lbs. Manual adjustment. Non-reversible.	Spring loaded—automatically adjusts to provide more pressure as sand increases in strength. Reversible.
Discharge Door	Hand fitted. No adjustment for wear.	Machined to close tolerance and equipped for wear adjustment. 100% larger opening.
Bearings	Sleeve.	Anti-friction throughout.
Drive	Open bevel, direct connected.	V-belt, self-contained, splash lubricated reducer.

BETTER BUILT

SERVICE AND OPERATING:

	1930 Simpson	Model F Mix-Muller
Lubricate	5 alemite fittings.	"One stop" centralized system for all interior components.
Plow Adjust	Wrench and hammer, from inside crib.	Can be adjusted from top of cross head.
Overhaul	Roll up sleeves. Crawl in mixer.	Roll out mullers and/or turret assy. through removable crib section—without dismantling hoods, hoppers, etc.

EASIER TO SERVICE

Circle 661 on Page 53

DON'T TRADE IT IN

UNTIL YOU ENTER THE

$5,000 HANDLEBAR HARRY CONTEST

you're too late after February 28!

ANY MIX-MULLER, new or old, can win a prize.

WRITE FOR ENTRY BLANK TODAY!

say "when"!

with MARSHALL ENCLOSED-TIP THERMOCOUPLES

...for strong, dense, uniform castings from every melt!

Reduce scrap rejects, misruns, cold-shuts ... achieve consistently high quality castings! Marshall Enclosed-Tip Thermocouples indicate instantly and accurately "when" to pour brass, bronze, aluminum, or magnesium melts. Frequent, regular, exact temperature readings help avoid shrinkage porosity, gas porosity, dross ... produce better casting finishes ... control aluminum grain size.

Dependable, easy-to-use Marshall Thermocouples *take interior temperatures deep within the melt.* Tip can be stirred to speed reading, giving *true temperature in about 20 seconds.* Pyrometer always indicates *steady, accurate reading.* Thermocouple wire can't become contaminated from melt or short-circuited by slag. Tip withstands scores of immersions before replacement is necessary. Mail coupon for catalog today!

L. H. MARSHALL CO.

270 WEST LANE AVE., COLUMBUS 2, OHIO

Furnace Type (above) ... lengths up to 10 ft., for use with Stationary Pyrometer.
Ladle Type (left) ... for use with Portable Pyrometer.

L. H. MARSHALL CO., 270 W. LANE AVE., COLUMBUS 2, OHIO

Please rush Catalog which fully describes Marshall Enclosed-Tip Thermocouples!

NAME_____

FIRM_____

STREET ADDRESS_____

CITY_____

rick Co., St. Paul. Formerly foundry division manager, Mr. Patton was named president of Valley Iron Works when it was acquired by American Hoist last year. Mr. Potter was previously chief mechanical engineer.

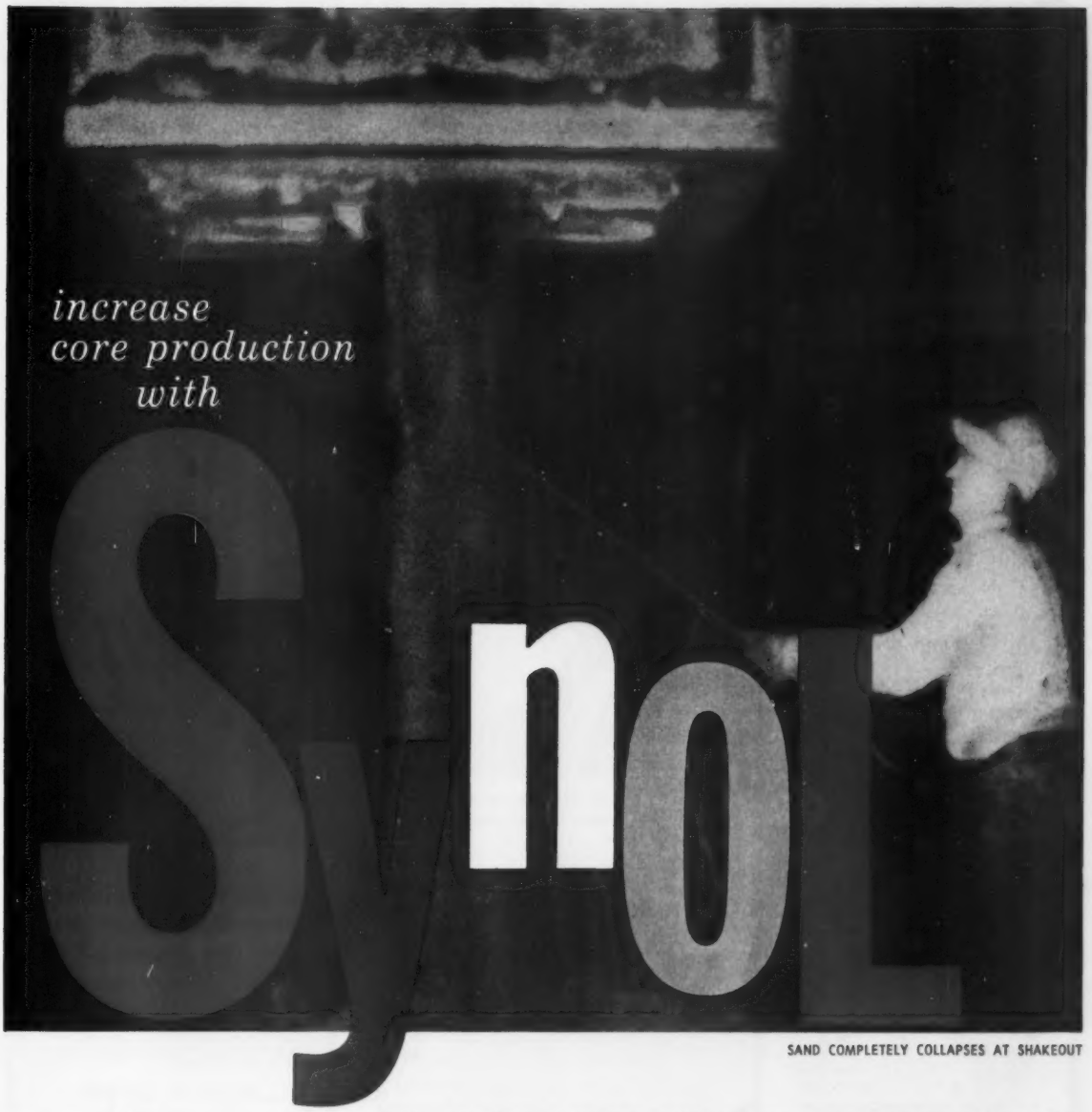
William H. Morgan, president, Morgan Engineering Co., Alliance, Ohio, was recently elected president of the Electric Overhead Crane Institute, Washington, succeeding **Arland R. Walkley**, general manager, Manning, Maxwell & Moore

WILLIAM H. MORGAN
. . . Crane Institute head

Inc., Muskegon, Mich. **William W. Peattie**, president, Northern Engineering Works, Detroit, was named vice president. Directors elected include **John S. Jackson**, Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.; **Robert F. Rice**, Whiting Corp., Harvey, Ill.; and **Harold H. Bansau**, Conco Engineering Works, Mendota, Ill. **Joe H. Peritz** was re-appointed executive secretary-treasurer.

John P. Baxter has been named sales representative in the Connecticut area, American Emery Wheel Works, Providence, R. I. He will be associated with **Charles A. Hanlon** in the new Bridgeport office.

P. R. Junod, Buffalo district salesman, Carborundum Co., Niagara Falls, N. Y., has been named Philadelphia district sales manger. Other promotions in the company's Bonded Abrasives Div. include **E. A. Japely**, sales manager, Area A, Chicago; **M. M. Craft**, Los Angeles district sales manager. **F. J. Blake**, sales manager in San Francisco, will also be responsible for bonded, coated, electro minerals and



SAND COMPLETELY COLLAPSES AT SHAKEOUT

THIEM DISTRIBUTORS

Brumley-Donaldson Company
Los Angeles & Oakland, Calif.

Combined Supply & Equip. Co., Inc.
Buffalo, New York

Lancaster Frdy. Supply Co., Lancaster, Penna.

LaGrand Industrial Supply Co.
Portland, Oregon

Manufacturers Equip. & Supply Co.
Chattanooga, Tenn., & Birmingham, Ala.

Fire Brick Supply Co., St. Paul, Minnesota

Western Foundry Sand Co., Seattle, Wash.

Kramer Industrial Supply, Inc., Denver, Colo.

Everitt H. Lueders, Bala Cynwyd, Penna.

Pearson & Smith, Spokane, Washington

Brandt Equip. & Supply Co.
Houston, Texas

James Crain, Caseyville, Illinois

Don Barnes Ltd., Hamilton, Ontario, Can.

AN AIR CURING LIQUID BINDER THAT PRODUCES CORES AND MOLDS WITH MINIMUM LABOR AND COSTS

- Increases sand flowability — improves workability — no ramming or jolting.
- Air cured strength controls true dimensional accuracy.
- Increases oven production — reduces baking period 40% — bakes at 375° — 425°.
- Complete sand collapsibility at shakeout reduces costs of rough cleaning.
- Produces clean and smooth casting surfaces.

Investigate SYNOL for use in your foundry's core production — write or phone your nearest Thiem distributor for details or the Thiem home office today!

THIEM PRODUCTS INC.
MILWAUKEE 19, WISCONSIN

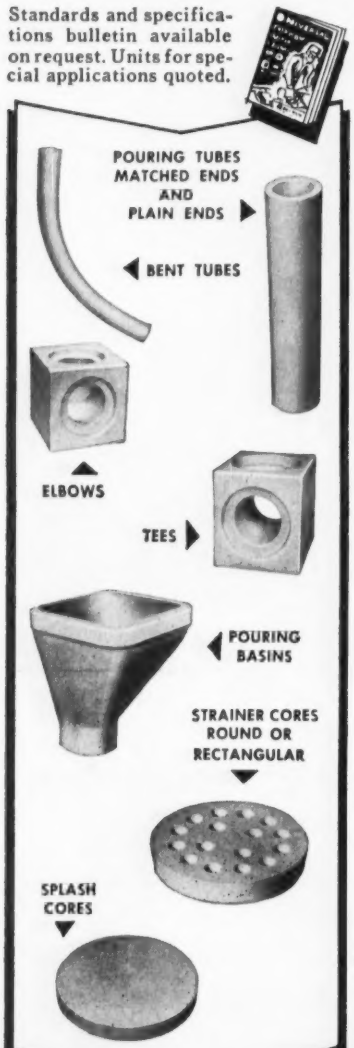
Sold with Service — *Manufacturers of foundry products exclusively*

Circle 663 on Page 53

UNIVERSAL
REFRACTORY GATING COMPONENTS

• The *Thinwal* construction, providing as much as *35% lighter weight* will not spall nor erode in use even at temperatures up to 3250°F. They eliminate slag inclusions, stop rejects, reduce cleaning room time.

Standards and specifications bulletin available on request. Units for special applications quoted.



UNIVERSAL
CLAY PRODUCTS CO.

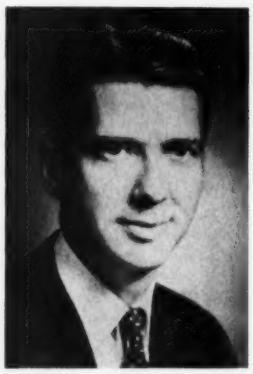
1515 First St. • MAin 6-4912 • Sandusky, Ohio
P.O. Box 1631

Circle 664 on Page 53

merchandising division sales in Alaska and Hawaii. The changes were effective January 1. **F. C. Guest** has retired as Detroit district sales manager, after 33 years of service. **K. H. Wisby**, assistant sales manager, has succeeded him there.

E. P. Lyons, formerly general manager, Cherry-Burrell Corp., Chicago, has been appointed manufacturing manager of Crane Co.'s Chicago works.

Robert W. Richardson, since 1957 assistant sales manager, has been appointed sales manager, Spencer



ROBERT W. RICHARDSON
. . . *Spencer Turbine sales mgr.*

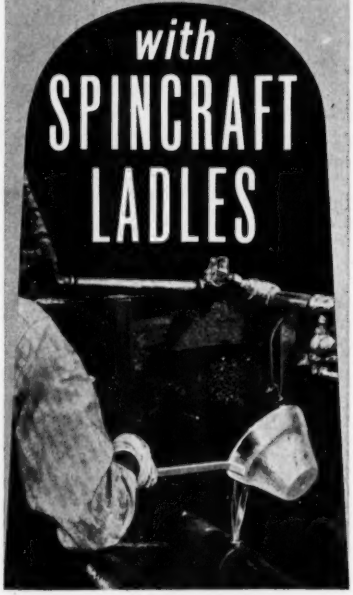
Turbine Co., Hartford, Conn. He joined the company in 1940. **David H. Hunt**, recently assistant chief engineer, has been named chief engineer.

Thomas J. Ready Jr., vice president and assistant general manager-aluminum operations, has been named executive vice president, Kaiser Aluminum & Chemical Corp., Oakland, Calif.

Charles W. Patton has been appointed a direct factory representative in New York state, Airetool Mfg. Co., Springfield, Ohio, with headquarters in East Aurora.

Carl F. Haertel, formerly works manager of the foundry and welding division, Falk Corp., Milwaukee, has been named castings and weldment consultant. **Ben C. Bugbee** has been named general works manager. Other appointments include **Arthur H. Nolde**, machine shop works manager, **P. Charles Fuerst**, foundry works manager, and **Robert J. Fisher**, weld shop works manager.

POUR EASIER, POUR FASTER, MORE POURS PER LADLE
with SPINCRAFT LADLES



Light, rugged, Spincraft ladles save replacement costs, make every pouring job easier! Available in a vast range of sizes, in stainless steel as well as mild.

•
LIGHT IN WEIGHT
LESS FATIGUE!
•
NON-SPILL SHAPE
NO WASTE!
•
EQUIPOISED HANDLE
BALANCED!

Write Today for Complete Data and Prices.

Spincraft
SKILL WILL DO IT

Division 2-0730
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MILWAUKEE 8, WISCONSIN

Circle 665 on Page 53

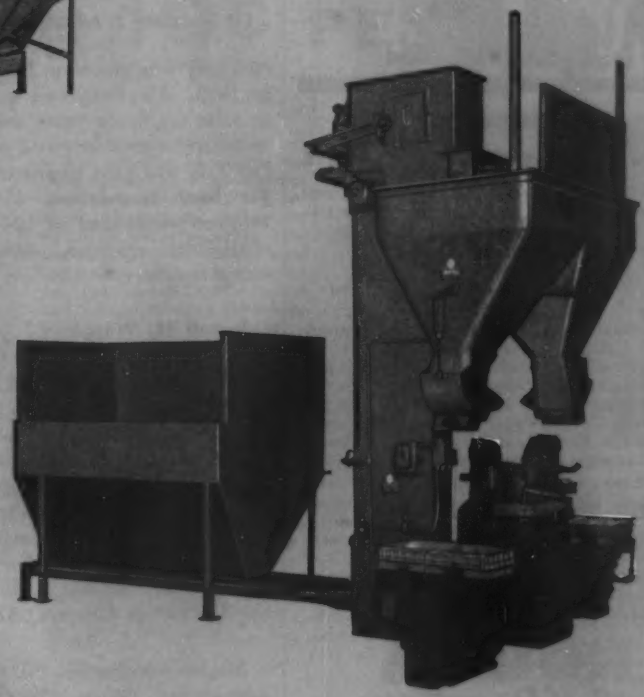
NOW! HANDY SANDY in TWO MODELS!

EXPANSION OF MODELS
for EXPANSION OF CAPACITY!

THE *HS* MODEL

6 TO 7 TONS OF SAND CAPACITY PER HOUR

This low-cost, individual-floor sand handling unit, enthusiastically accepted by the foundry industry "*as the most economical method for furnishing overhead sand to molding stations,*" takes a low capital expenditure to progressively mechanize foundries with HANDY SANDYS. One installation leads to others, and the savings with each one helps pay for the next HANDY SANDY.



THE *EHS* MODEL

"BIG BROTHER of the HS Model"
UP TO 20 TONS OF SAND CAPACITY PER HOUR

8-inch by 5-inch cast buckets; 10-inch wide rubber-covered elevator belt; cast head and tail pulleys; heavy duty anti-friction bearings throughout; cutting blade type of aerator with separate motor drive.

Newaygo MOVIES are yours for the asking

"PROGRESSIVE MECHANIZATION," a 16mm, 33-minute, movie shows Newaygo equipment in nine foundries. "NEWAYGO PALLET SYSTEMS FOR MOLD HANDLING," another 16mm. 25-minute movie, presents many types of Pallet Line Installations in foundries.

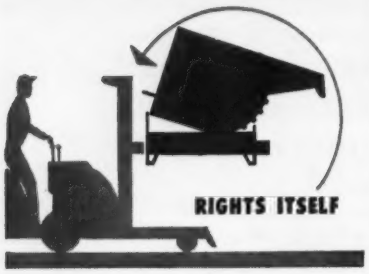
"Foundry Business is **BIG** BUSINESS . . ."

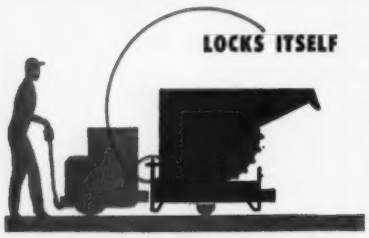
Write for BULLETIN 59

NEWAYGO engineering company
NEWAYGO, MICHIGAN

. . . and profitable, too, with NEWAYGO MOLD HANDLING, SAND HANDLING AND CONDITIONING EQUIPMENT

Also Manufacturers and Installers of MULTI-LEVEL HOPPER CONTROL SYSTEMS, CAR CONVEYORS, APRON CONVEYORS, ROTARY FEEDERS and FOUNDRY AUTOMATION





Cuts handling time ...and costs...in half

Here's the fastest, lowest cost method ever devised for handling all kinds of bulk materials . . . hot or cold . . . wet or dry . . . such as:

Punch Press Parts . . . Cinders
Hot Forging or Castings . . . Scrap Metal
Pickles . . . Soybean Meal

A Roura Hopper fits any standard lift truck . . attached or detached in seconds . . can't slip off. One man does the entire job. Picks up loaded Hopper with lift truck . . . transports it to destination . . . flips the latch . . . and the Hopper automatically dumps its load, rights itself, locks itself. Cuts costs 50% or more.

They're sturdily made of heavy ¼" steel plate with continuous arc-welded joints. Five sizes from ½ to 2 yards capacity. Fitted with live skids or a choice of wheels. Standard models available for immediate shipment from stock. For special applications they can be made of stainless steel or galvanized.

ROURA *Self-Dumping* **HOPPER**

WANT MORE FACTS?
We'll give you full details . . . without obligation . . . if you'll attach this coupon to your letterhead . . . sign your name . . . and mail to . . .

ROURA IRON WORKS, INC.
1418-C Woodland Ave., Detroit 11, Michigan

Circle 667 on Page 53

Obituary

John C. Pangborn, 75, since 1957 vice chairman of the board of directors, Pangborn Corp., Hagerstown, Md., died Dec. 24. In 1905 he joined his brother, Thomas W. Pangborn, in the Pangborn Corp., which the latter had formed the year before in New York. The

JOHN C. PANGBORN

company was moved to Hagerstown in 1912. Mr. Pangborn was active in sales for many years and served as first vice president and treasurer. He also was vice chairman of the Pangborn Foundation, which the brothers established in 1945 to aid charitable, religious, educational, and scientific activities.

Joseph H. Warner, 62, president of J. H. Warner & Co., Camden, Tenn., sand company, died Dec. 29. Before moving to Camden in 1946, he was vice president of Porter Warner Industries Inc., Chattanooga. An authority on the applications of bonding clays, Mr. Warner was well known for his development work in foundry sands. For the last several years he was a director of the Mid-South Chapter, AFS.

August Kornburger, 80, owner of Kornburger Pattern Works, Milwaukee, died Nov. 30. He founded the company in 1927, and retired in 1950. Previously he had been with Allis-Chalmers Mfg. Co., and A. O. Smith Corp., Milwaukee.

James E. Facemire, 64, foundry sales engineer, Helmick Foundry-Machine Co., Fairmont, W. Va., died Dec. 27 in Pittsburgh.

John Horne, retired founder and operator of the former West End Pattern Works, Cleveland, died Dec. 28. A native of Scotland, he went to Cleveland about 1910, and had operated the pattern works for more than 30 years until his retirement in 1953.

I. Theodore Kahn, 78, chairman of the board, Consolidated Iron-Steel Mfg. Co., Cleveland, died Dec. 12. He helped expand the company and its subsidiaries, Republic Structural Iron Works, Taylor & Boggis Foundry, Cleveland Lock Works, and Ackerman Plastic Moulding Co.

Max W. Goldberg, 80, president of Modern Equipment Co., Port Washington, Wis., and vice president of Newburg Machine Co., died

MAX W. GOLDBERG

Dec. 22. He was born in Germany, and came to America at the age of ten. Working in a Wisconsin foundry as a pourer stimulated Mr. Goldberg's development of a mechanical pouring device for distributing and pouring hot metal. A sealed-top watercooled cupola was among his other developments in foundry equipment.

W. A. Chappie, sales manager, Maynard Electric Steel Casting Co., Milwaukee, died Dec. 31.

Julius Pollack, 76, former secretary-treasurer of the Republic Brass Co., Cleveland, died Dec. 11. Mr. Pollack retired from Republic Brass,

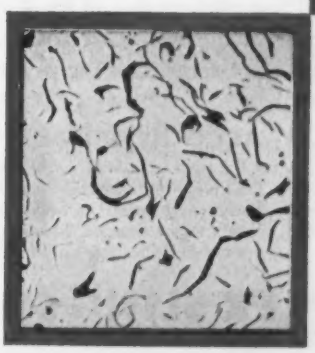
No. 8® GRAPHITIZER

TREATS GREY IRON EFFECTIVELY FOR LESS THAN 10¢ PER TON!

Thousands of foundries are already employing No. 8 because it is such an amazingly simple and accurate graphitizer. No. 8 is a powerful inoculant. It plants graphite *throughout* the molten metal. No. 8 gives castings a higher machinability rating. It reduces chill and hardness in thin sections and improves wear and shock resistance. No. 8 makes castings more metallurgically uniform and, most important of all, No. 8 graphitizer *substantially reduces the cost of metal control* (cost figures in several foundries are below 10¢ per ton of metal treated). No. 8 is easy to apply by funnel or envelope method. As the photomicrographs shown here indicate, No. 8 is effective for special metallurgical control. From every standpoint it will pay you to use No. 8, regularly. For further details write for Engineering Bulletin No. 2.

Base Iron

Photomicrograph from broken half of 1.25 arbitration bar of gray iron not treated with No. 8 Cupola charge was made up of 48% steel, 33% cast scrap, 19% malleable pig iron and 45 lbs. of silicon briquettes. Total charge was 2544 lbs. This iron tested to the following physical properties: Transverse Strength 2,497 lbs. (wedge bar) • Brinell Hardness 229 (wedge bar) • Total Chill Depth 41/32 in., Clear Chill 26/32 in. • Deflection 0.23 in.



Treated Iron

Photomicrograph from broken half of arbitration bar of same base iron treated with 1 lb. per ton of No. 8. Holding time in ladle following addition of Graphite was less than 8 minutes. Note how the addition of No. 8 has destroyed the dendritic pattern and has given a normal flake pattern. The treated iron tested to the following physical properties: Transverse Strength 2,970 lbs. (wedge bar) • Brinell Hardness 217 (wedge bar) • Total Chill Depth 13/32 in., Clear Chill 10/32 in. • Deflection 0.31 in.

Note how the iron treated with No. 8 has increased in deflection. Usually iron treated with No. 8 will show an increase from 10% to 30% in deflection over the base iron value—this means less cracked castings and more serviceable metal.

GF240-1

THE UNITED STATES GRAPHITE COMPANY

DIVISION OF THE WICKES CORPORATION, SAGINAW 14, MICHIGAN

GRAPHITAR® CARBON-GRAPHITE • GRAMIX® POWDER METALLURGY • MEXICAN® GRAPHITE PRODUCTS • USG® BRUSHES

One of these sling chains will meet your most exacting needs

One-day delivery is forthcoming when you specify ACCOLOY KUPLEX Sling Chains. Made up locally by an authorized KUPLEX distributor, these slings feature matched components which have been proof-tested at the factory at twice working load limits to assure their being as strong as the chain itself.

Factory-built all-welded construction is assured when you buy ACCO *Registered* Sling Chains. Registration ring and certificate—signed by ACCO—attest to the successful test performance of the sling.

See your local distributor for ACCO *Registered* or ACCOLOY KUPLEX sling chains. If by chance he does not carry the sling you want, write our York, Pa., office for further details.

ACCOLOY KUPLEX

• Available in 6 chain sizes (¼" to ⅞") in single, 2-leg, 3-leg and 4-leg styles. Assembled from Shaped Master Link, Drop Forged Kupler and Hook, ACCOLOY 125 chain.

ACCO Registered®

• Factory-built with ACCOLOY 125 chain. Chain is welded under scientific control and heat treated to optimum strength levels. New Shaped Master Link withstands deformation under heavier loads.

ACCOLOY KUPLEX SLING CHAINS

ACCO Registered® SLING CHAINS

ACCO **American Chain Division • American Chain & Cable Company, Inc.**

Bridgeport, Conn. • Factories: *York and *Braddock, Pa., *San Francisco, Calif.

Sales Offices: *Atlanta, Boston, *Chicago, *Denver, Detroit, *Houston

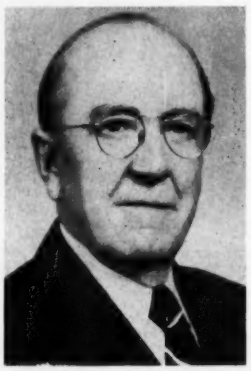
*Los Angeles, New York, Philadelphia, Pittsburgh, *Portland, Ore. *San Francisco

*Indicates Warehouse Stocks

now part of Briggs Mfg. Co., Warren, Mich., in 1956, after 30 years with the company.

Kenneth Simms, 65, sales representative, Independent Foundry Supply Co., Los Angeles, died Nov. 16. He had been with the company 16 years.

Emanuel H. Nielsen, 75, who retired in 1954 as foundry consulting engineer, Whiting Corp., Harvey, Ill., died Dec. 24. A native of



EMANUEL H. NIELSEN

Denmark, Mr. Nielsen joined Pulverized Coal Engineering & Equipment Co., Chicago in 1916. In 1919 he became associated with Grindle Fuel Equipment Co., going to Whiting with that organization.

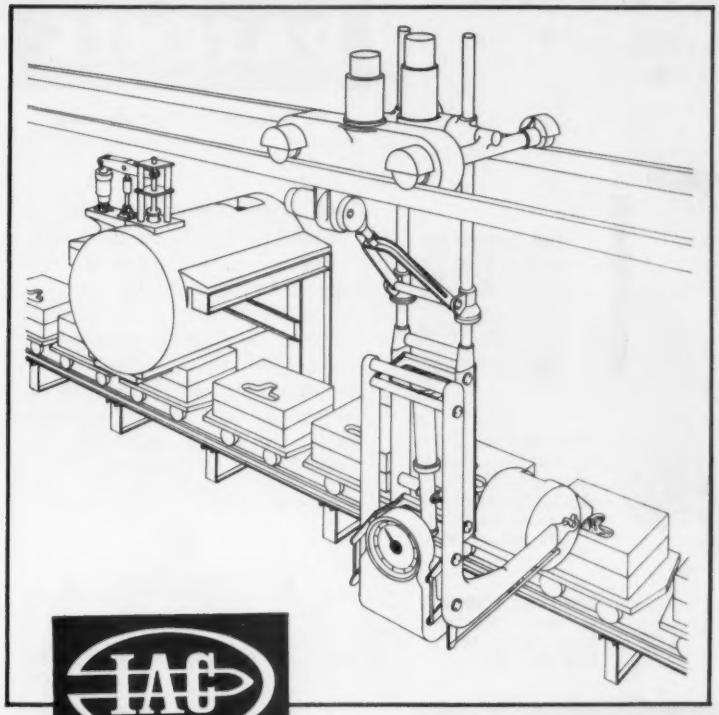
Glenn Eisaman, 53, Pittsburgh district sales manager, Carborundum Co., Niagara Falls, N. Y., died Dec. 1. He had been with the company 26 years.

Hugh Martin, 69, president, Martin Foundries, Detroit, died Dec. 11. Mr. Martin founded Detroit Gray Iron & Steel Foundries Inc. and Detroit Alloy Steel Co., Detroit, and served as president of both.

Ralph C. Feigles, 50, works manager, Sprout, Waldron & Co., Muncy, Pa., died Dec. 13.

Robert R. Schultz, 50, for the last nine years executive vice president and general manager, Rogers Iron Works Co., Joplin, Mo., died Dec 6.

I. E. Shaer, Boston representative, Claude B. Schneible Co., Detroit, died recently.



this fully automated pouring device

Saves manpower and metal

Improves casting yield

Reduces scrap losses

Assures perfect pouring rate control

Eliminates the "human element"

IAC

PRESENTS THE FULLY AUTOMATIC POURING DEVICE
(Patents Pending)

POURMATIC

The POURMATIC has been developed specifically for the high production foundry. Successfully tested for 3 years in a modern automated malleable iron foundry, it provides the latest advancement in foundry automation and pouring technology. You will be interested in the substantial savings which this automatic pouring method can bring to your operation. Write today for further details.

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Gentlemen:
Please send me further information on the I.A.C. POURMATIC

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COMPANY .....

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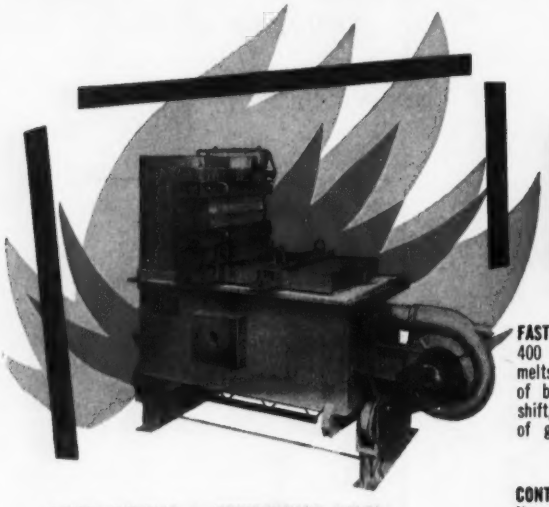
ADDRESS .....

.....

Circle 670 on Page 53

SAVE $ WITH REDA FURNACES

FUEL SAVINGS UP TO 50% REPORTED
USING REDA GAS-OIL FIRED FURNACES!



BEST HEAT EFFICIENCY

FASTER MELTING — One 400 series Reda Furnace melts up to 11,000 lbs. of brass or bronze per shift, and up to 6,000 lbs. of gray iron per shift.

CONTINUOUS POURING — No waiting until floors, flasks, boards, etc. are filled with molds!

LOWER MELTING & MAINTENANCE COSTS — One man can operate a Reda Furnace . . . No daily repairs needed!

FURNACE DIVISION WRITE TODAY FOR DESCRIPTIVE BULLETIN
REDA PUMP COMPANY - BARTLESVILLE, OKLAHOMA

Circle 671 on Page 53

Orefraction
ZIRCON
Sand and Flour

THIS TRADEMARK HAS BECOME
A HALLMARK

Long the trademark of Orefraction Zircon, this symbol has become a hallmark in the Foundry Industry.

As the word Sterling is to Silver, Orefraction is to Zircon. Purity and Uniformity are assured.

REMEMBER — THERE'S NO BETTER ZIRCON THAN OREFRACTION ZIRCON.

Write for New Foundry Industry Data Sheet and Name of Your Orefraction Distributor

Orefraction
MINERALS INC.
P. O. BOX 247 ANDREWS, S. C.

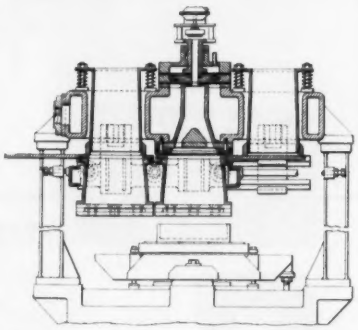
Circle 672 on Page 53

PATENTS

Of Interest to Foundrymen

Core Blowing Machine

A machine for automatically producing sand cores employs two sand hoppers arranged so that they are moved alternately under a blow chamber. A vertically moving table beneath the blow chamber raises open-top coreboxes into sealing position as the sand-containing hopper moves under the blow chamber. Movement of hoppers, coreboxes,



etc., as well as injection of compressed air into blow chamber, are controlled by conventional control box and mechanism. *Patent No. 2,905,988 granted to Russell F. LaBeau and assigned to Sutter Products Co.*

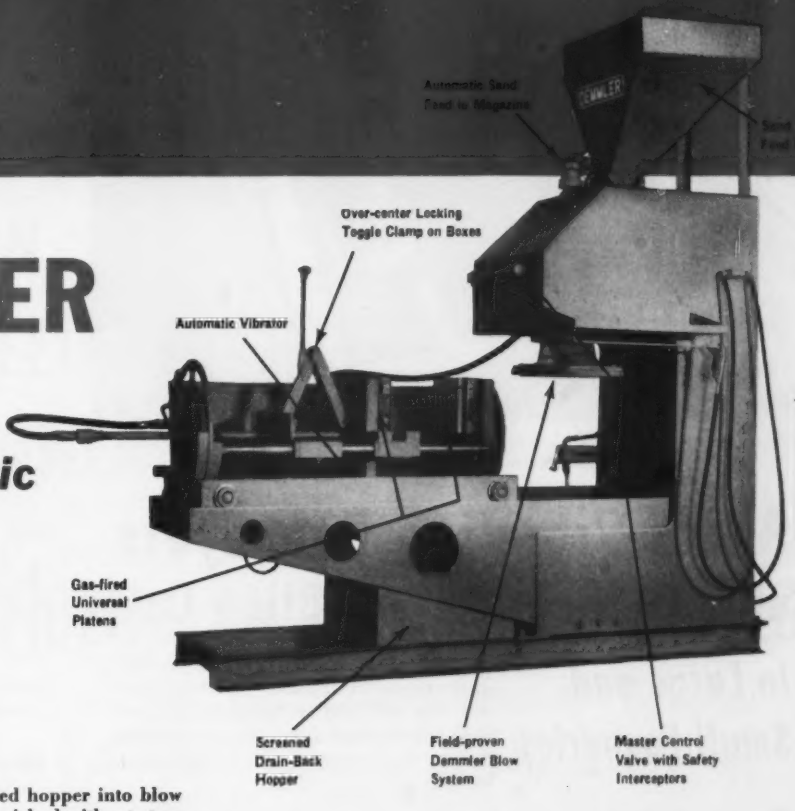
Mold Production Unit

Essential features of this unit include 1) two molding machines on opposite sides of a conveyor, 2) manipulating arms to move molds from the machines to the conveyor, 3) mold stripper, and 4) apparatus for automatically locating slipbands or auxiliary boxes on assembled molds during pouring. Manipulating arms are situated adjacent to the molding machines on vertical pivots or columns on which they can be rotated horizontally and moved up or down. Arms are arranged so they may be rotated 180°, and flasks or mold boxes are attached permanently to the arms.

Flasks are positioned by the arms on patterns on the molding machines, and when filled with sand are swung onto the conveyor in the proper positions by the manip-

NOW—a low cost
true shell core blower
of rugged Demmler quality
for only $1995.00...
shipping wt. 1500 lbs.

Typical cores suitable for production on the "Utility" shell core blower.


Automatic Sand Feed to Magazine
Sand Mix Feed Hopper
Over-center Locking Toggle Clamp on Boxes
Automatic Vibrator
Gas-fired Universal Platens
Screened Drain-Back Hopper
Field-proven Demmler Blow System
Master Control Valve with Safety Interceptors

DEMMLER

"Utility"

Semi-Automatic

Shell Core Blowers

OPERATING FEATURES:

1. Sand fed automatically from feed hopper into blow magazine. Hopper can be replenished without stopping production.
2. Over-center toggle lock for positive box closing and opening.
3. Master control lever shuttles box under blow head, clamps it, blows, unclamps and shuttles box to rollover drain position.
4. Rollover designed so that weight of boxes remain within the radius of rotation . . . no out of balance weight to struggle with.
5. Vibration applied to boxes automatically in rolled-over drain position for consistency of core wall thickness.

MODEL # 121015—VRD

Max. Box Size	12"x 10" x 15" Deep
Max. Core Weight, before draining	20 lbs.
Sand Feed Hopper Capacity	250 lbs.
Price, FOB Kewanee, Illinois	*$1995.00

*Price includes quality blow-off gun and spray gun.

MODEL # 242030—VRD

Max. Box Size	24" x 20" x 30" Deep
Max. Core Weight, before draining	80 lbs.
Sand Feed Hopper Capacity	1000 lbs.
Price, FOB Kewanee, Illinois	*$4990.00

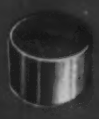
*Price includes quality blow-off gun and spray gun.

DEMMLER MANUFACTURING COMPANY • KEWANEE, ILLINOIS

PRECISION CORE BOX VENTS

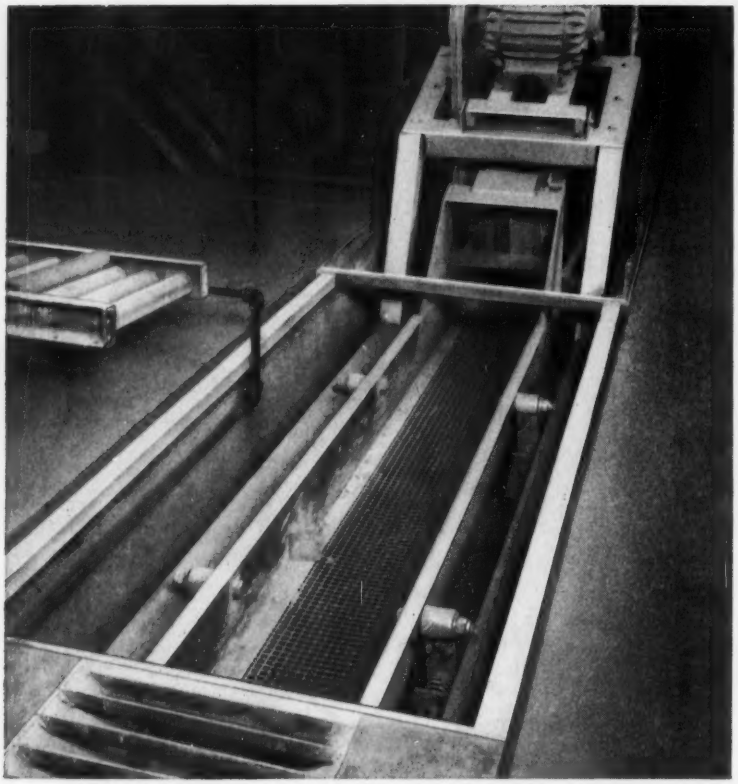
Demmler is by-far your best source for precision core box vents, manufactured by specialists who pioneered in the core blower industry. Many sizes, slot widths and screen meshes are available in brass and steel core box vents.

Circle 673 on Page 53



HL 250 MESH VENTS

A new general purpose vent which practically eliminates the cleaning coarser screens demand. Write for literature on Demmler vents.



Photograph shows Ajax Lo-Veyor installed below floor. Floor grids similar to those shown in foreground have been removed to show arrangement of conveyor pan with screen.

AJAX Vibrating Conveyors
Cut Screening and Handling Costs
in Large and Small Foundries

With today's skyrocketing costs, the importance of reducing non-productive expense was never more urgent. Large and small foundries are saving money by conveying sand with Ajax Lo-Veyors.

Photograph shows part of a complete Ajax Lo-Veyor installation in a bronze foundry. Molds are dumped on floor grids at the end of each of ten pouring lines. Large lumps, core butts, and refuse are screened from the sand while being conveyed to the reconditioning system.

Send for latest AJAX SELECTION GUIDE

Learn how Ajax Vibration Engineering Service can help you cut your costs. Phone, write, or send coupon for your copy of this helpful book.

AJAX

AJAX FLEXIBLE COUPLING CO. INC.
204 Portage St., Westfield, N. Y.

In Canada—The Alexander Fleck, Ltd., Ottawa

Please send Ajax Lo-Veyor Selection Guide to

Name_____

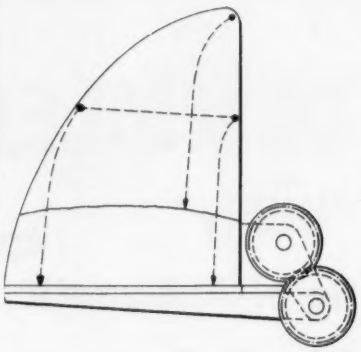
Concern_____

Address_____

ulating arms. Mold stripper or press forces the molds from the flasks onto the conveyor. Assembled molds travel by conveyor to an area where slip bands or auxiliary flasks are placed automatically in position. *Patent No. 2,904,858 granted to Michel P. A. Pinchon and assigned to Societe Anonyme Fonderies Chokier.*

Shell Mold Apparatus

Patent relates to a machine for manufacture of shell molds. Essential feature is a dump box designed so that a uniform distribution of the molding medium is obtained on the pattern. This is claimed to be attained by arranging



the walls of the container or dump box so that they recede in respect to the trajectory of the molding material. *Patent No. 2,905,987 granted to Jacob S. Hoekstra and Henricus J. M. Verschure.*

Hot-work Die Steel

Die steel contains 2.5 to 6 per cent Co, 1.5 to 2.75 per cent Cu, less than 0.15 per cent C, up to 6 per cent Cr, less than 1 per cent V, Mn, and Si, less than 3.5 per cent Mo, W in a ratio of between 5:4 and 4:3 to Mo, and remainder principally Fe. *Patent No. 2,908,565 granted to John A. Nelson and assigned to Continental Copper & Steel Industries Inc.*

Sand Binder

Material is an alkali metal silicate binder to be hardened by carbon dioxide, etc. Contains 60 to 95 per cent by weight of liquid sodium silicate having a SiO_2 : Na_2O ratio of about 1.5 to 3.3 : 1.0 and a solids content of about 38 to 46 per cent to which is added about

I-R Size 810 IMPACTOOL
¾" Square Drive

NEW DESIGN FASTER SPEED GREATER POWER

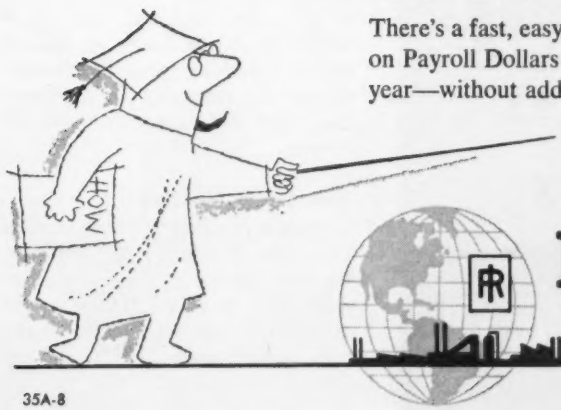
. . . to give you an

ANNUAL DIVIDEND ON PAYROLL DOLLARS!

If your operators are using older model Impactools on fastening operations, you can increase their man-hour productivity by as much as 750 Payroll Dollars in one year, just by replacing the older tools with brand new I-R 810 Impactools.

Multiply these Annual Dividend Savings by the number of Impactool operators in your plant, and you can see why management today is taking a new look at portable tool operations.

There's a fast, easy way to calculate the amount of Dividend Savings on Payroll Dollars that new I-R Tools can help you earn in just one year—without adding to your present payroll.



It's yours without obligation. To get it, call your I-R AIRengineer today. Or write Ingersoll-Rand, 11 Broadway, New York 4, N. Y.

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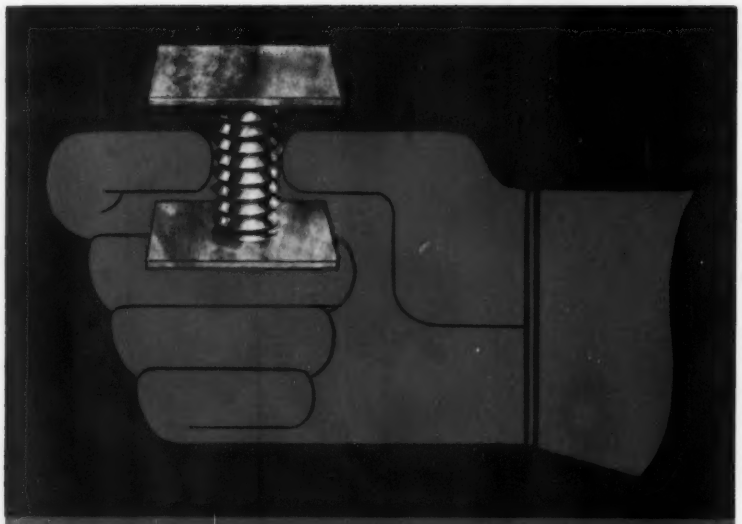
Tools plus AIRengineering increase output per man

35A-8



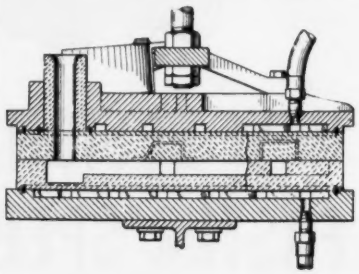
There is a
MILWAUKEE
CHAPLET
or CHILL
for every
CASTING JOB
to insure better castings
to reduce scrap losses
to reduce labor costs

Milwaukee Chaplet & Mfg. Co.
1025 SOUTH 40th STREET • MILWAUKEE 46, WISCONSIN

1 to 20 per cent of finely divided solid sodium meta silicate and 1 to 25 per cent polyhydroxy organic compound such as sugar, sorbitol, glycerine, etc. *Patent No.* 2,905,563 *granted to F. P. Ilenda and C. E. Peeler Jr., and assigned to Diamond Alkali Co.*

Vacuum Casting Metals

This casting apparatus consists of a plaster mold and a plate containing a number of interconnected passages in the face resting on the mold. Passages lead to an opening for connection to a means of air evacuation. The opening is



counterbored for insertion of a porous disc to prevent possible entry of metal which might cut off the vacuum. *Patent No.* 2,908,054 *granted to William G. Wilkins and assigned to Universal Castings Corp.*

Refractory Permanent Mold

Pertains to formation of a refractory shell mold from 0.1 to 0.75 in. thick which later is bonded to a relatively thick backing of a heat conductive nonferrous metal such as aluminum. Refractory in finely divided form may be carbides of tungsten, silicon, and molybdenum steatite, etc., bonded with thermosetting resins, borosilicates, waterglass, etc. Material is placed on the pattern and baked for 5 to 10 minutes, removed and again baked 24 to 48 hours at 450 to 700° F. Backing metal then is cast against the refractory shell. *Patent No.* 2,903,761 *granted to E. S. Sirmay.*

Investment Molding

Process involves application of a thin film of cellulose on wax pattern by dipping in a solution composed of 1 to 3 per cent by weight of methyl cellulose, 0.5 to 2 per cent wetting agent, 0.01 to 0.2 per cent formaldehyde, 0.025 to 0.07 per cent ammonium hydroxide, 15

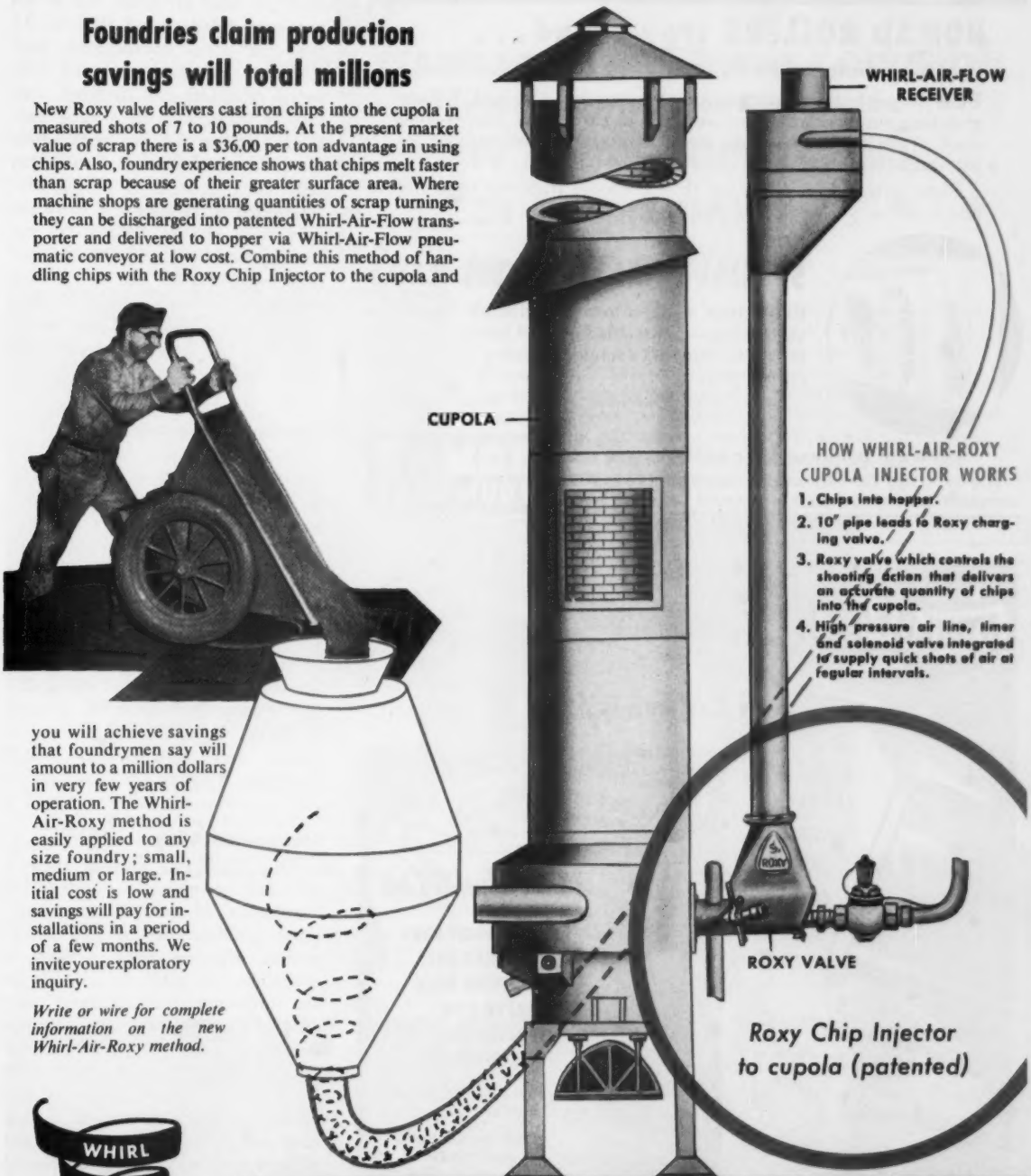
SAVE $36.00 a ton on cast iron chips

New Whirl-Air-Roxy method delivers chips from Machine Shop to Cupola *(patented)*

Foundries claim production savings will total millions

New Roxy valve delivers cast iron chips into the cupola in measured shots of 7 to 10 pounds. At the present market value of scrap there is a $36.00 per ton advantage in using chips. Also, foundry experience shows that chips melt faster than scrap because of their greater surface area. Where machine shops are generating quantities of scrap turnings, they can be discharged into patented Whirl-Air-Flow transporter and delivered to hopper via Whirl-Air-Flow pneumatic conveyor at low cost. Combine this method of handling chips with the Roxy Chip Injector to the cupola and you will achieve savings that foundrymen say will amount to a million dollars in very few years of operation. The Whirl-Air-Roxy method is easily applied to any size foundry; small, medium or large. Initial cost is low and savings will pay for installations in a period of a few months. We invite your exploratory inquiry.

Write or wire for complete information on the new Whirl-Air-Roxy method.


WHIRL-AIR-FLOW RECEIVER
CUPOLA
HOW WHIRL-AIR-ROXY CUPOLA INJECTOR WORKS
1. Chips into hopper.
2. 10" pipe leads to Roxy charging valve.
3. Roxy valve which controls the shooting action that delivers an accurate quantity of chips into the cupola.
4. High pressure air line, timer and solenoid valve integrated to supply quick shots of air at regular intervals.
ROXY
ROXY VALVE
Roxy Chip Injector to cupola (patented)

WHIRL AIR FLOW PNEUMATIC CONVEYORS

WHIRL-AIR-FLOW

NOMAD ROLLERS *stay* round . . .

designed for 75 lb. to 2500 lb. loads!

Built for sturdiness and smooth performance, Nomad Rollers give long wear because they are made of carburized, heat-treated steel. Twin rows of bearings give balanced load distribution. No lubrication required.

Since only a few rollers are shown, choose from our *complete* line to solve your roller needs.

SPECIAL ANALYSIS STEEL RAILS

Rails come in three load capacities to fit job requirements—light, standard and heavy. Supplied in 16 ft. lengths, rounded bearing surface and milled ends.

Light — ⅜" x 2", Standard — ½" x 2½", Heavy — ¾" x 3"

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DESIGNERS and MANUFACTURERS of COMPLETE CONVEYOR SYSTEMS

NOMAD EQUIPMENT

Circle 678 on Page 53

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Chill Nails and Spiders
You can rely on "KOOLHEAD" and "STANHO" products
for...
ACCURATELY CONTROLLED FOUNDRY CHILLING
Write for samples and prices
Choose any style from Jumbo to Stubby; slim, medium or horse nail blade; blunt, pointed, straight or 90° bent. There's a type and size Koolhead Chill Nail or Spider Chill to do your specific chill job best.
STEEL
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and other Stanho products Bulk or Packaged
WRITE for CATALOG and PRICES
STANDARD
Since 1872
HORSE NAIL CORP
NEW BRIGHTON, PA

to 30 per cent silicic acid and 65 to 84 per cent water. Film is allowed to dry and pattern is dipped in slurry consisting essentially by weight of 15 to 30 per cent refractory cement, 35 to 70 per cent silica flour, 15 to 35 per cent water, 0.1 to 0.3 per cent wetting agent, 0.1 to 1 per cent octyl alcohol, up to 2 per cent glycerine, 0.1 to 0.4 per cent gelatine and 0.05 to 0.3 per cent conc. hydrochloric acid.

Coated pattern is stuccoed with coarse refractory and air dried. Pattern is invested with a grog containing 43 to 74 per cent finely divided burned fireclay, 6 to 25 per cent silica flour, 6 to 17 per cent condensed ethyl silicate, 6 to 17 per cent ethyl alcohol, 0.02 to 0.1 per cent hydrochloric acid, 0.9 to 7 per cent water and 0.1 per cent setting accelerator for the ethyl silicate. *Patent No. 2,908,952 granted to Harold L. Benham and assigned to General Motors Corp.*

Aluminum-base Alloy

Preferred compositional limits of this alloy are 7.6 to 8.6 per cent Si, 0.4 to 0.55 per cent Mg, 0.1 to 0.3 per cent Be, 0.1 to 0.3 per cent Ti, 0.002 to 0.006 per cent Na, 0.2 per cent max. Cu, 0.4 per cent max. Fe, 0.2 per cent max. Mn, 0.2 per cent max. Zn, 0.2 per cent max. Cr, 0.5 per cent max of each other impurity up to 0.15 per cent total max., and remainder Al. *Patent No. 2,908,566 granted to Roger G. Cron and Romeo A. Zueck and assigned to North American Aviation Inc.*

Magnesium Alloy

This Mg-Zn-Zr casting alloy is intended to eliminate undesirable segregation of a Zn-Zr compound. After addition of Zn and Zr to molten Mg, the alloy is held in the range of 1200 to 1275° F in the quiescent state without permitting temperature fluctuations exceeding preferably 20° F for at least 40 minutes and preferably for 1 hour. After settling of the unalloyed Zn-Zr compound during that period, the supernatant liquid alloy is transferred to a clean heated steel crucible and poured into castings or ingots. *Patent No. 2,906,619 granted to Keith Roberson and Elmer H. Massner and assigned to Dow Chemical Co.*

Circle 679 on Page 53

Kold-Set Savings

FOR STANDARD STEEL WORKS DIVISION

Baldwin-Lima-Hamilton Corporation

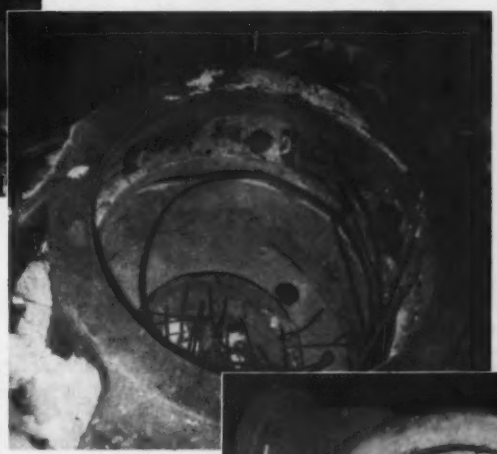
19 HOURS COREMAKING

38 HOURS BAKING

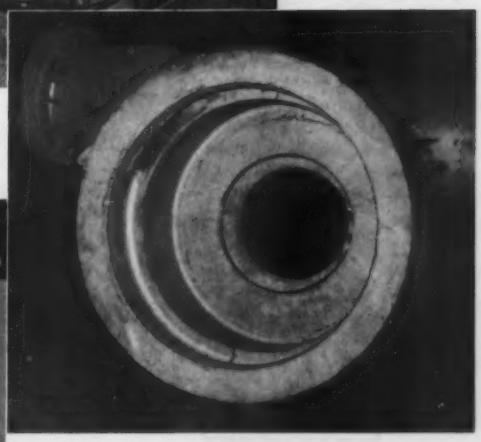
12 DAYS DELIVERY

In making this 34,000 lb. blower casing dramatic savings were achieved through the use of the KOLD-SET Binder Process. KOLD-SET coremaking time was only 5 hours as compared with 24 hours in the conventional method. Baking required only 10 hours at 450° (48 hours conventional). An additional savings in coring of the mold was evident because of the dimensional accuracy of KOLD-SET cores. The savings in cleaning costs as suggested by the illustration here were even more significant.

Casting immediately after shakeout, showing gate side where Kold-Set Facing Mix was used in all fillets of risers and pads.



Internal cored surface prior to core rod removal and shake out. All Kold-Set core sand flowed free from the cored section except in a small area where a hand chisel was used to peel some adhering sand. These cores were covered by metal of 3½" to 8" and withstood 67,000 lb. pouring weight.



Casting after complete riser removal, heat-treating and shotblasting. No air tool was used, except to take out one core rod which had to be bent to remove.

KOLD-SET®

PRODUCTS FOR FOUNDRY PROGRESS

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Warehouse Stocks in Chicago, Boston, Detroit, Philadelphia

Write: for latest technical data . . . or for details on how Kold-Set can save money and improve casting quality for you.

Kold-Set is Patented in the United States

PYRO LANCE

get below surface readings for greater accuracy

Temperature readings of molten nonferrous metals are only accurate when taken below the surface, unaffected by dross and other surface conditions. That is why there is industry-wide acceptance of the Alnor Pyro Lance.

Portable, handy to use, the Alnor Pyro Lance has a protected thermocouple mounted in the lance tip. Enclosed couple is protected against flame, fumes and corrosion, assuring long, accurate service under severe conditions.

Pyro Lance models are available for a wide variety of metals and foundry operations. Write today for Bulletin 1724-D and see how you can have low-cost quality control in your foundry. Illinois Testing Laboratories, Inc., Room 511, 420 North LaSalle St., Chicago 10, Illinois.

Alnor

PRECISION INSTRUMENTS FOR EVERY INDUSTRY

Circle 681 on Page 53

Court Decisions Cover Protection of Patterns

Pattern Size and Shape Are Property of Owner

By Albert W. Gray

● DEVELOPMENT of cracking processes in refinery operations in the early days of gasoline production created a demand for vessels or stills that could withstand both high pressure and temperature and at the same time be of adequate capacity. Hammer-welded vessels were limited in their wall thickness to 1⅝ inches. Riveted structures lacked integrity in failing to react to pressure or heat as a single piece of metal. Welded seams often led to fires and explosions.

A manufacturer of such stills conceived a vessel of plates so joined that they created a single, huge, tubular structure—the plates fused at their meeting edges by an electric arc.

Suit subsequently was brought by this manufacturer against a competitor for the protection of this plan from piracy by the competitor. An employee of the welding department of the still manufacturer, to whom knowledge of the new method had been entrusted in confidence, had been induced by the competitor to leave his employment and accept a position with the competitor. This step had been followed by the appropriation of the new method of still construction, which until that time had been a secret of the manufacturer.

Of these circumstances and granting an injunction against the use of this information by the competitor, as sought by the manufacturer in its suit, the Federal court said, "Protection is frequently granted against invasion of proprietary secrets through breach of confidence in the absence of express contract."

Value Not Affected—Then of the protection of methods and processes not entitled to the benefits of a patent that court added, "The mere fact that the means by which a discovery is made are obvious, that experimentation which leads from known factors to an ascertainable but presently unknown result may be simple, we think, cannot destroy

Water Works

HARDER-FASTER

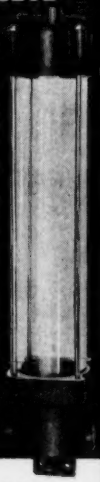
when conditioned with the

AQUADYNE SYSTEM

The water you use in (1) sand conditioning, (2) core and mold washes, (3) cupola linings, and (4) CO_2 core cleaning has greater penetration and dispersion when conditioned in the simple AQUADYNE way, thus...

- *Reduces the amount of water needed*
- *Reduces sand temperature*
- *Makes sand feel wetter than it really is*
- *Wets sand, clay, dust, etc., faster*

Write for literature
Dealer inquiries invited



AQUADYNE CORPORATION

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Circle 682 on Page 53

Eliminate pinhole porosity and oxide inclusions in aluminum castings with

Foseco DEGASERS

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P. O. Box 8728, Cleveland 38, Ohio

Circle 683 on Page 53

Gray Iron Foundry Milestones — No. 1

ARCHEOLOGICAL STUDIES have unearthed findings, dating back several thousand years B.C., which relate to the melting and casting of iron ores. Impure bog ores were reduced to spongy masses and cast into molds hewn of stone to form crude agricultural implements and weapons. To help increase the fluidity of the molten metal, animal and sometimes human bones were added to the melt.

This was the humble beginning of a craft that has developed, down through the centuries, into the highly specialized Gray Iron Industry of today. From machinery to bathtubs, from steel mill rolls to motor housings, gray iron castings play a vital role in the nation's industrial growth.

As a supplier of quality foundry coke and pig iron, Pittsburgh Coke & Chemical Company is proud to contribute to the continuing growth of the great Gray Iron Foundry Industry.

Reproductions of the "Primitive Iron Makers," suitable for framing, may be obtained without charge by writing to the Coke & Iron Division, Pittsburgh Coke & Chemical Company, Grant Building, Pittsburgh 19, Pennsylvania.

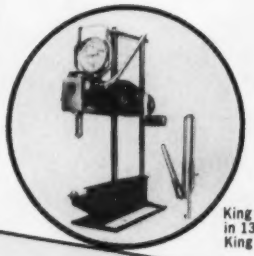
Neville Pig Iron and Neville Coke for the Foundry Trade

PIG IRON • COKE • FERROMANGANESE • CEMENT • COAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON

MAKE ALL BRINELL HARDNESS TESTS WITH

The KING PORTABLE TESTER

King Test Head with Chain Adapter



King Test Head in 13½" base with King Brinell Scope

ONE TEST HEAD FITS MANY INEXPENSIVE ADAPTERS

King Test Head in 30" base

King Bore Brinell with small test head for pipes, cylinders, etc.

The KING PORTABLE HARDNESS TESTER

- To test any size, shape or thickness of metal.
- Makes guaranteed accurate on-the-spot tests — anywhere!
- Gap 10" — 13½" — 30". Throat 4" — 6¾" or larger with chain adapter.
- Loads from 62½ Kg. to full 3000 Kg. 5mm or 10mm steel or carbide ball.
- Will make tests in places no other tester can reach — including cylinder bores.

Write for literature and prices to Dept. F-260

KING TESTER CORPORATION 440 N. 13th St., Phila. 23, Pa.

Known the world over for accuracy and dependability

Circle 685 on Page 53

Pre-Alloyed Furnace Charges

at a cost less than the price of their original components!

Quality Controlled Stainless and Nickel-Cobalt Alloys in Briquettes, Cut Plates, Stampings and other forms

● These Pre-Alloyed Furnace Charges from Security Alloys, pioneer processors of alloyed nickel, will help reduce your melting time because of their high density and uniform analysis. Tailor-made to most commercial and military specifications, requiring fewer foundry additives and permitting easier prediction of casting analysis.

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For more information on how our Pre-Alloyed Furnace Charges can save you time and money, *write to Foundry Division, Security Alloys Company, Incorporated, 3106 West 49th Place, Chicago 32, Illinois or phone PRospect 6-8500.*

SEND FOR FREE POCKET-SIZE ALLOY SLIDE CHART

Complete analysis of over 100 nickel-cobalt alloys

FOUNDRY DIVISION

SECURITY ALLOYS CO. INC

Circle 686 on Page 53

the value of the discovery to one who makes it or advantage the competitor who by unfair means or as the beneficiary of a broken faith, obtains the desired knowledge without himself paying the price in labor, money or machines expended by the discoverer.

"Facts of great value may, like the lost purse upon the highway, lie long unnoticed upon the public commons. Hundreds pass them by till one more observant than the others makes discovery. It is idle to say that in the eyes of the law interest may not in such case follow discernment."

In its determination here of the right of the owner of a pattern or process to protection against the piracy of unscrupulous competitors, the court relied for authority on the law as it was asserted many years before in a decision of the highest court in New York state.

Patterns Were Duplicated — In that instance, patterns for a rotary pump had been held by the owner in secret and in his exclusive possession. While the pumps made from these patterns had been freely marketed, the patterns themselves had been carefully withheld from the public. To repair these patterns, the owner entrusted them to a patternmaker. While they were in this man's possession, he surreptitiously made a duplicate set for his own use.

In its decision on the lawsuit brought against the patternmaker for his deceit—the decision followed as authority in the recent action involving the arc-welded petroleum stills—the court said, "Are not the size and shape of the patterns, therefore, a secret which their owner has not published and in which he still has an exclusive property?

"Can it be truthfully said that this secret can be learned from the pump when experiments must be added to what can be learned from the pump before a pattern of the proper size can be made. As more could be learned by measuring the patterns than could be learned by measuring the component parts of the pump, was there not a secret that belonged to the discoverer until he abandoned it by publication or it was fairly discovered by another?

"The fact that one secret can be discovered more easily than another

BT TURNOVER

* PRESS-BUTTON OPERATION
* FAST PRODUCTION
* AUTOMATIC MOLD REMOVAL

TECHNICAL REPRESENTATION, SERVICE AND ALL SPARES NOW AVAILABLE IN U.S.A. AND CANADA

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for full particulars of these and other models

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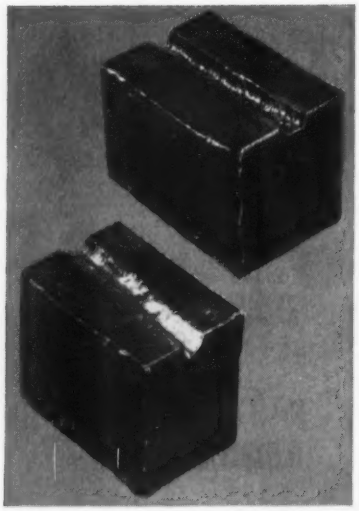
P2316



Which stainless steel block was grooved in 12 seconds?

It took 10 minutes to chip a ¼" deep, ⅜" wide groove in this 3¼" long stainless steel block on the left. Arcair did a better job in just 12 seconds . . . or 1/50th of the time. (See block at right.) Groove is 5/16" deep; 7/16" wide. Both blocks were cut from the same stainless.

You can groove, cut, gouge or bevel *any* metal faster with Arcair . . . get significant cost savings. Yet, the Arcair process costs less than $100.

HOW DOES ARCAIR WORK? The torch uses 80 p.s.i. air, welding machine current and special electrodes to melt and instantly blow away metal. There's no oxidation. New operators learn everything in 15 minutes.

WHAT'S YOUR PROBLEM? Write us. Without obligation, we will recommend correct torch and method to help you cut costs. (Or, call your Arcair welding supply distributor.)

Arcair

THE ARCAIR CO.,
465 S. Mt. Pleasant St., Lancaster, Ohio
Send me more information on Arcair Torches and special electrodes.

NAME _____ TITLE _____
COMPANY _____
ADDRESS _____
CITY _____ STATE _____
MY PROBLEM _____

Circle 688 on Page 53

does not affect the principle," continued the court in conclusion. "Even if resort to the patterns was more of a convenience than a necessity, still if there was a secret, it belonged to him and the patternmaker had no right to obtain it by unfair means or to use it after it was thus obtained.

"We think that the patterns were a secret device that was not disclosed by the publication of the pump and that the owner of the patterns was entitled to the preventive remedies of the court. While the patternmaker could lawfully copy the pump because it had been published to the world, he could not lawfully copy the patterns because they have not been published, but were still in every sense the property of their owner, who owned not only the material substance but also the discovery which they embodied."

References

A. O. Smith Corporation v. Petroleum Iron Works Co., 73 Fed. 2d 531, Ohio.
Tabor v. Hoffman, 23 N. E. 12, New York.

Book Review

***Selected Methods of Analysis of Foundry Materials,* Part 1. Pig Iron and Cast Iron, plastic cover, 97 pages, 6¼ x 9¾ in., published by the British Cast Iron Research Association, Bordesley Hall, Alvechurch, Birmingham, England. Price $2.50.**

This volume represents the results of experimental work since 1950 by the BCIRA Sub-Committee on Methods of Analysis. It is the first part of a manual of methods for use by the chemist, and deals with the sampling and analysis of pig iron and cast irons for carbon, silicon, manganese, sulfur, phosphorus, nickel, chromium, molybdenum, copper, titanium, and vanadium. Sections also are included on spectrophotometric methods, laboratory equipment, apparatus, and reagents and laboratory techniques.

The committee points out that to make the manual concise and suitable for bench work, the subject matter has been restricted to the practical details of each method. Emphasis is on choice of methods which will give reliable results under routine conditions rather than on reference methods. All methods selected were investigated exhaustively by the sub-committee.

long-run POURING

with Perfect FLEXIBILITY at ANY Temperature!

Industrial

TYPE 592T

Type 592T, standard ladle recommended for automated production, is simple, safe, strong and dependable.

This ladle with Industrial Universal Bail eliminates gear bind and drag — frees the Foundryman forever from all heat distortion troubles.

Bail connection needs no lubrication or adjustments. Trunnion bearings have perfect freedom of movement within carefully determined limits. Result: A ladle with longer, more profitable life, immeasurably greater ease of operation than is assured in any other equipment.

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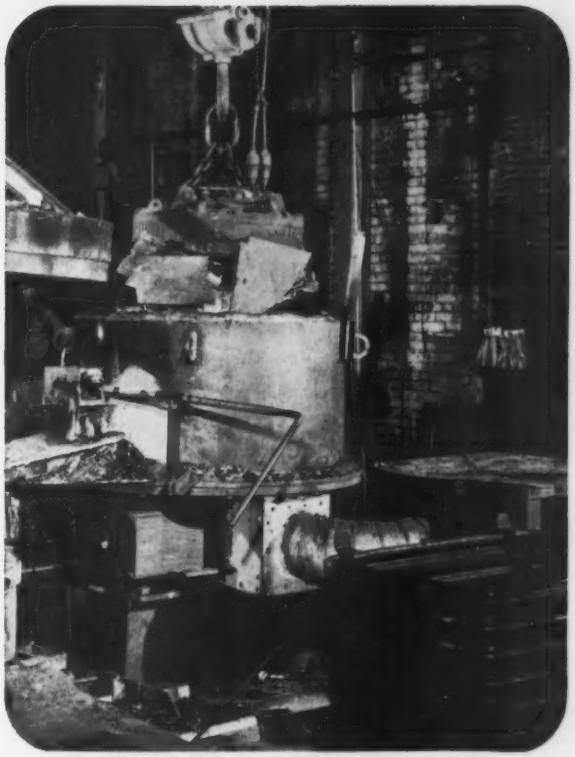
Circle 689 on Page 53

5 ways to make your foundry more efficient with OHIO MAGNETS

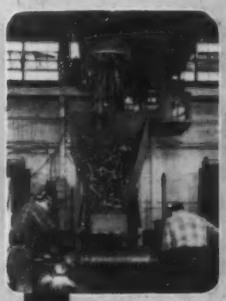


1 CHARGING FURNACE. One 36-inch Ohio Bolted Magnet charges six 375 KW furnaces giving 240 500-pound heats each 24 hours.

2 SCRAP HANDLING. All scrap is handled efficiently, economically with Ohio Magnet. Single 36-inch magnet replaces grapple, clamshell, bucket or lift truck.

3 SORTING. Castings are conveyed from Wheelabrator to hard-iron inspection. Ohio Magnet picks parts out of sorting bins.

4 UNLOADING ANNEALING FURNACE now takes one man 10 to 20 minutes with Ohio Magnet. Lift truck used to take 1 to 2 hours.



5 LOADING GRINDING HOPPER after conveying parts from inspection department. Same Ohio Magnet is used for operations shown in photos 3, 4 and 5.

Photos: Courtesy I-F Manufacturing Company, New Philadelphia, Ohio

ohio ELECTRIC

Small foundry or large, magnetic materials handling points the way to higher productivity, higher efficiency. And with Ohio Magnets on the job you get high availability, too. That's because Ohio Magnets are built with that extra margin of safety that means long, service-free life. Yes, *magnetic materials handling pays—especially with Ohio Magnets.*

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the controlled silicate CO_2 binder

MORE SPEED. Curing time ranges from ten seconds to three minutes, depending on type of mold or core.

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MORE PROFIT. With MOROC you can get this extra capacity and flexibility with a smaller investment in equipment than would be required for additional ovens or shell-molding equipment.

MOROC COMES IN FOUR GRADES

MOROC 1. High-strength binder.

MOROC 2. High-strength and good collapsibility.

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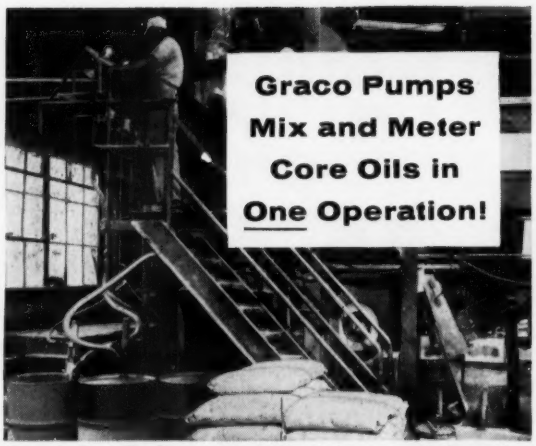
MOROC 4. Extra-high collapsibility and good flowability.

Write for complete information. Diamond Alkali Company, 300 Union Commerce Building, Cleveland 14, Ohio.

Diamond Chemicals



Graco's Fast-Flo Pumps can increase the efficiency of liquid handling operations. As photo shows, core oils and additives are being selected by foundry worker. They'll be transferred in regulated amounts, then mixed with sand in metered quantities. Pump uses air only when delivering fluids. Can empty full size drum in less than three minutes.

Send for more information about this amazing Graco Fast-Flo pump that's especially suited for modern fluids handling. The economical Fast-Flo can transfer, agitate and dispense. Use it as a supply pump, for mixing or spraying. It handles fluids as thin as alcohol, as thick as glue. Here's the pump that can save you money.

FREE IDEA BOOK SHOWS GRACO PUMPS FOR EVERY NEED. SEND FOR IT TODAY!

GRACO
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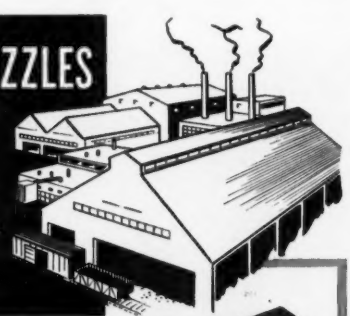
Minneapolis 13, Minnesota

(See Phone Book Yellow Pages, Spraying, for Graco Suppliers)

Circle 709 on Page 53

SPRAY NOZZLES

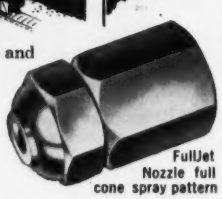
to improve general foundry operations *and increase* product quality



Complete choice of nozzle types and capacities for every foundry need. Typical spray nozzles supplied are:

FOR GAS OR AIR WASHING

Fulljet or Whirljet spray nozzles in any material or capacity to fit your system. Open internal design and large orifices for non-clogging advantages.



Fulljet Nozzle full cone spray pattern

FOR AUTOMATIC MOLD LUBRICATION

Pneumatic Atomizing nozzles, pneumatically actuated for required intermittent operation.

automatic Pneumatic Atomizing nozzle

Made by America's leading designers and manufacturers of industrial spray nozzles.

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3238 RANDOLPH ST., BELLWOOD, ILL.

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ADVANCE SPRAY NOZZLE DESIGN FOR NEW DIMENSIONS IN CONTROL AND PERFORMANCE

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Complete stock of spray nozzles maintained for prompt delivery.

For complete information write for Catalog 24... forty-eight pages of complete nozzle data.

Circle 710 on Page 53

Circle 708 on Page 53

MORE QUALITY ENGINEERED FEATURES IN STEPHENS-ADAMSON CARRIERS

Series # 200 Carriers

Series #700 Carrier

35° and 45° Deep Trough Carriers

Pneumatic "Impact" Carriers

ADVANTAGES

- Spun-end roller assemblies and parts interchangeable for quick installation.
- One-Piece, all-steel, welded frame construction.
- Positive lubrication . . . pre-lubricated at factory . . . provisions for field lubrication.
- Roller brackets tilt two degrees in direction of travel for greater belt training effect.
- Die-cast labyrinth bearing seals keep grease in . . . dust and dirt out.

S-A

WRITE FOR BULLETIN 355

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STEPHENS-ADAMSON MFG. CO.
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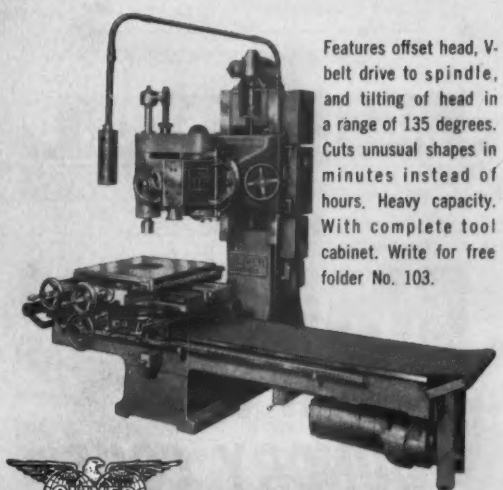
PLANTS LOCATED IN: LOS ANGELES, CALIFORNIA
CLARKSDALE, MISSISSIPPI • BELLEVILLE, ONTARIO

Circle 691 on Page 53

Cut complex patterns of wood and aluminum—faster!

"OLIVER" No. 103 PATTERN MILLING MACHINE



Features offset head, V-belt drive to spindle, and tilting of head in a range of 135 degrees. Cuts unusual shapes in minutes instead of hours. Heavy capacity. With complete tool cabinet. Write for free folder No. 103.

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for plates

... that stay flat

pattern

... and last longer

core

... specify Moltrup

bottom

For accurate casting results specify Moltrup Plates. They are long-lasting and stay flat—because Moltrup employs a special flattening process designed to permanently eliminate buckling or bending. Consequently your investment goes further and your profit margin increases. Plates are made to your specifications. Write or phone us for complete information.

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F-2

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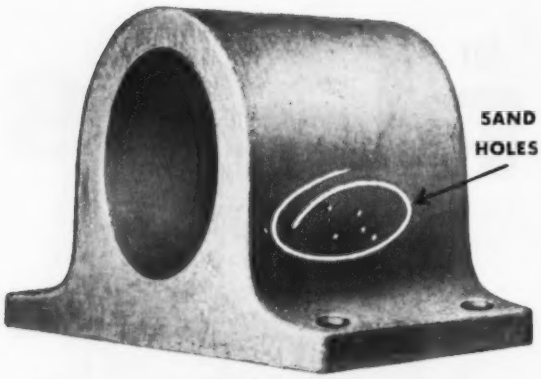

Save This Casting *with* SMOOTH-ON FOUNDRY CEMENTS

Often a perfectly good casting has blow or sand holes, surface blemishes, or rough and porous areas that detract from its appearance. But there's no reason why it can't *look* as good as it really is.

Simply use Smooth-On Foundry Cement. It goes on easily, quickly . . . hardens rapidly at a predictable rate . . . stays firmly in place.

SHADINGS TO MATCH ANY CASTING

4A • Medium Gray
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Quality Control That Assures You of Tight, Lasting Repairs

Every lot of Smooth-On Foundry Cement is laboratory tested for setting time, hardness and color. You can be sure of tight, lasting, good looking results every time, provided the directions are followed.

See how much better your castings will look after treatment with Smooth-On, known and used by leading foundries for more than 63 years. Try one or more of these cements at our expense. Write today—on your business letterhead—and we will send you free samples.

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SMOOTH-ON FOUNDRY CEMENTS

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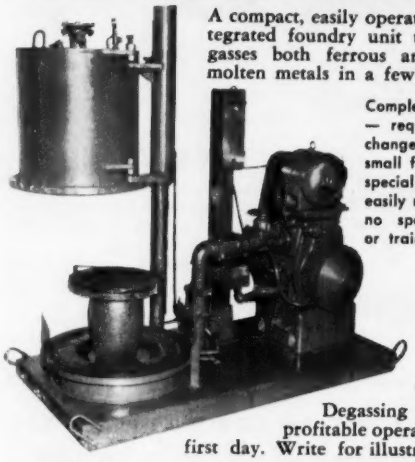
REJECTS and SCRAP due to gas are practically eliminated by . . . Model 400 VACUUM DEGASSING CHAMBER



A compact, easily operated, entirely integrated foundry unit thoroughly degasses both ferrous and non-ferrous molten metals in a few minutes.

Complete package unit — requires no process changes — occupies small floor space — no special foundation — easily moved — requires no special experience or training.

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This Vacuum Degassing Unit permits profitable operation from the first day. Write for illustrated bulletin.

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Complete facilities to produce all types of welded constructions . . . carbon or stainless steel and aluminum from 1/16″ to 4″ thick . . . to your specifications.

This includes tanks, chutes, hoppers, machine bases, stacks, breechings, angle rings, special cars, buckets, and other equipment.

Call or write for estimate. Let us show you how we can save you time and money.

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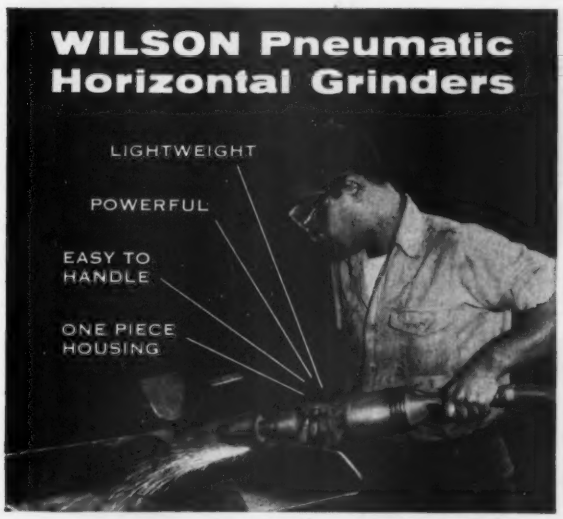

Faster grinding...less operator fatigue

Wilson's new Horizontal Grinders speed grinding, buffing, wire wheel work and many other metal removing and finishing operations. Available in various sizes and models, with speeds ranging from 3100 to 12,000 r.p.m. Write for Catalog PT-58.

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BETTER TOOLS FOR BETTER WORK

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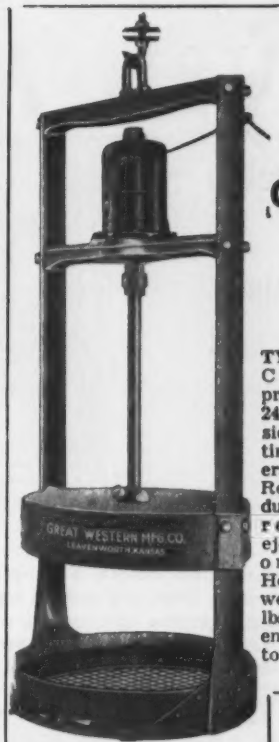

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"Greatest Name in Motion"

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TYPE "CR". Complete price $385.00. 24″ dia. round sieve. Sifts, fluffs, mixes, aerates sand. Height 4'6″, weight 250 lbs., 1/3 H.P. enclosed motor.

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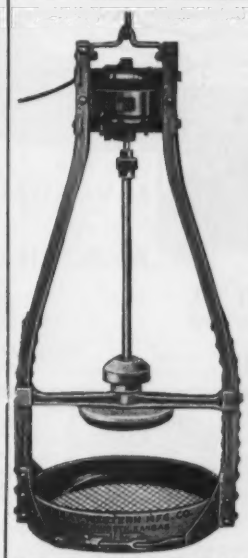

TYPE "V". Price, 20″ Sieve, $300.00. Does the work of 10 men. Screens sand, Fine, Medium, and Coarse. 20″ dia. sieve with special clamp for 5-second changes. Height 4'6″, weight 100 lbs., fully-enclosed 1/6 H.P. motor. Also available in Giant V-5 with 36″ sieve for triple capacity . . . Price $545.00.

MAIL THE COUPON NOW!

GREAT WESTERN MFG. CO.
Leavenworth, Kansas **Phone MU-22201**
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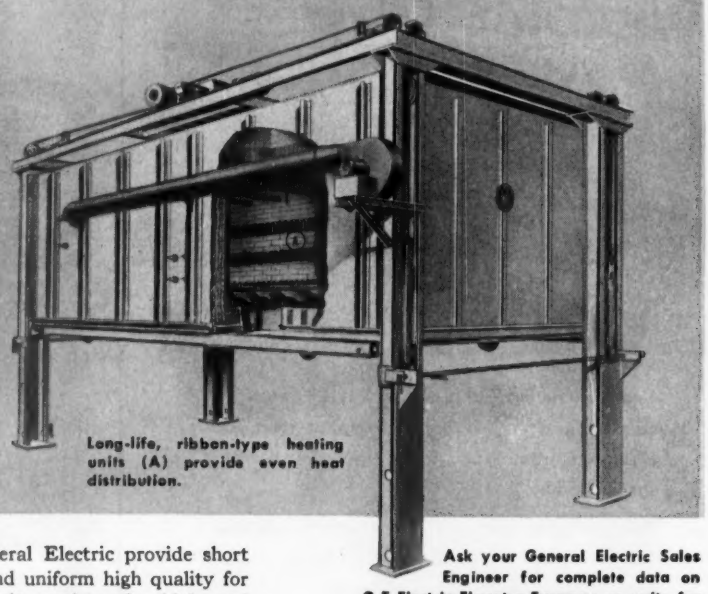
Circle 700 on Page 53

HEAT

from General Electric

for batch annealing of standard and pearlitic malleable iron



Long-life, ribbon-type heating units (A) provide even heat distribution.

Electric Elevator Furnaces from General Electric provide short production cycles, lower operating costs, and uniform high quality for your malleable iron annealing. Complete unit consists of a high- and a low-temperature furnace. A self-generating protective gas or controlled atmosphere is used—instead of sand—to protect parts, thus reducing time cycle and heat input. Uniform heat distribution and accurate temperature control assure a proper annealing cycle for all pieces. The elevated design gives you extra floor space. And longer operating life results because elevator lift eases loaded cars into place without jarring.

Ask your General Electric Sales Engineer for complete data on G-E Electric Elevator Furnaces or write for bulletin GED-3991. General Electric Company, Schenectady 5, N. Y.

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Progress Is Our Most Important Product

GENERAL ELECTRIC

Circle 701 on Page 53

Some of the Many Foundries utilizing Euclid Cranes . . .

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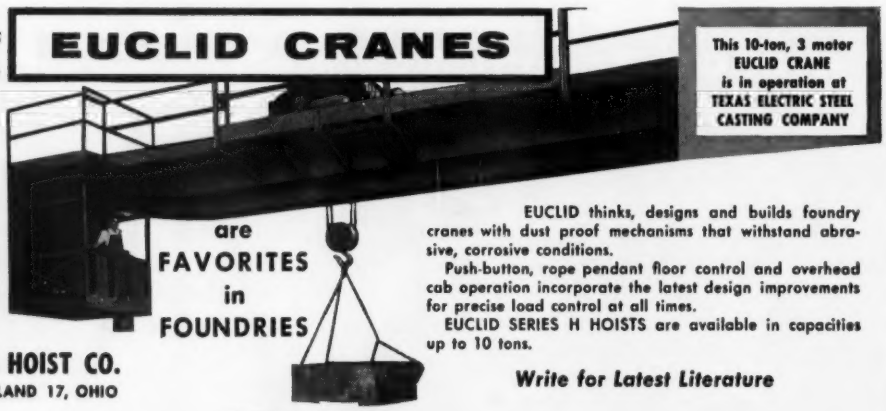
M. B. M. Foundry, Inc.
Kasper Foundry
Duplex Foundry
Larson Foundry
Alcoa Foundry
Interlake Iron Corp.
Texas Electric Steel Casting Co.

EUCLID CRANES



This 10-ton, 3 motor EUCLID CRANE is in operation at TEXAS ELECTRIC STEEL CASTING COMPANY

are FAVORITES in FOUNDRIES

EUCLID thinks, designs and builds foundry cranes with dust proof mechanisms that withstand abrasive, corrosive conditions.

Push-button, rope pendant floor control and overhead cab operation incorporate the latest design improvements for precise load control at all times.

EUCLID SERIES H HOISTS are available in capacities up to 10 tons.

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SHALLOW DEEP EXTRA DEEP

CONCAVE RECESSED CO_2

Slotted core box vents for every purpose. Inserting drill (right) ideal for inserting core vents. Special cleaning tool saves time.

C. M. SMILLIE & COMPANY
1124 WOODWARD HGTS.
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INSERTING DRILL

CLEANING TOOL

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METALLURGIST OR MECHAINCAL ENGINEER

To supervise the department of our plant making Ni-Resist and Ductile iron using induction furnaces. The person should have proven administrative record with a minimum of six years foundry experience. Age 28-38 years. Excellent opportunity and top wages.

NOBLESVILLE CASTING CO., INC.

NOBLESVILLE, INDIANA

Telephone Westfield, Indiana #3-3285 between 7 p.m. and 9 p.m.

FOUNDRY SUPERINTENDENT

Required for a foundry located in Western Canada producing carbon, high alloy, and low alloy steel. The successful applicant must be cost-minded, have leadership qualities, a metallurgical background, and be able to assume substantial responsibilities, including molding, coremaking, heat treating and the cleaning room. A good alloy steel casting technical background is essential, with a minimum of three years experience as a molding foreman or in other senior shop supervisory work. Age requirement is 35 to 55. Salary commensurate with the scope of the position. Reply in confidence, giving complete resume of experience, education and salary expected to:

BOX 146, FOUNDRY

PENTON BLDG. CLEVELAND 13, OHIO

MANUFACTURER

Seeking manufacturer to make and sell thoroughly developed foundry testing equipment.

BOX 186, FOUNDRY

PENTON BLDG. CLEVELAND 13, OHIO

METALLURGIST

B.S. Degree. Recent graduate with up to 3 years experience preferred. Duties would include supervision of Applied Research on projects related to nonferrous investment castings. Plant located in New England. Salary commensurate with qualifications.

BOX 143, FOUNDRY

PENTON BLDG. CLEVELAND 13, OHIO

STEEL FOUNDRY SUPERINTENDENT

Experienced in all phases of foundry procedure and cleaning room operations, to take charge of a modern, progressive, medium sized steel foundry in the southwest area. Reply with complete details including salary expected, references, and recent photograph.

BOX 183, FOUNDRY

PENTON BLDG. CLEVELAND 13, OHIO

JUNIOR ENGINEERING ASSISTANT

To work on cost estimating, drafting, quality control, in aluminum permanent mold and die casting plant. Excellent opportunity for a permanent position and advancement with a well established progressive organization. Forward resume, salary range, and recent photo prior to interview.

EASTERN CASTING CORPORATION DIVISION
THE EASTERN MALLEABLE IRON CO.
64 SOUTH WILLIAM STREET
NEWBURGH, N. Y.

METALLURGIST

B.S. Degree. A recent graduate or a man with several years experience. We produce gray iron and ductile. Please provide complete background in first letter including references and salary desired. Colorado location. Address: Box 150, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

BARNEY GAXIOLA

"Please contact Pat Lioi, GEneva 18596. Very urgent." Signed: Wm. J. Hanson, 3120 Long Beach Blvd., Long Beach 7, Calif.

WANTED

Graduate engineer or metallurgist for iron casting sales and service. Must be under 34 years. Excellent opportunity with growing organization in Wisconsin. Address: Box 149, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT—SANITARY WARE

NEEDS MAN AS ASSISTANT TO MANAGER FOR MANUFACTURING CAST IRON PLUMBING FIXTURES. GOOD OPPORTUNITY AND FUTURE. **NATIONAL PLUMBING FIXTURE CORP., P. O. BOX 1050, COLUMBUS, OHIO.**

FOUNDRY SUPERINTENDENT

For nonferrous foundry division of electrical fittings manufacturer in St. Louis. Young, aggressive engineer with practical experience preferred. Address: Box 174 FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• HELP WANTED

METALLURGIST

Graduate metallurgist preferably with some experience in steel foundry operations. Exceptional opportunity in a modern progressive, medium-sized steel foundry associated with a malleable and ductile foundry and machine shop in the southwest area. A wide range of operations in carbon, low alloy, stainless, and wear-resistant steels. Reply with complete details, including salary expected, reference, and recent photograph.

BOX 151, FOUNDRY

PENTON BLDG. CLEVELAND 13, OHIO

ENGINEER

With substantial foundry design and layout experience. Knowledge of modern materials handling equipment and material flows required. Real opportunity with excellent salary, bonus and profit sharing. Degree is essential. Send complete details in confidence.

BOX 168, FOUNDRY

PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY FOREMAN

An expanding foundry in Wisconsin, producing high quality gray iron castings for the agricultural and automotive industries, requires a molding line foreman. Plant is modern in every respect, with much mechanized equipment. Broad knowledge of foundry and molding practices necessary. Position is an attractive one and offers opportunities for advancement. Replies will be kept in confidence. Please list complete background in first letter, including references and salary desired.

BOX 159, FOUNDRY

PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY SUPERINTENDENT

$10,000—$15,000

A once in a lifetime opportunity to associate with modern foundry. Will consider top assistant. Client assumes all expenses. Contact Wm. Newell in confidence.

MONARCH PERSONNEL

28 E. JACKSON BLVD., CHICAGO 4, ILL.

FOUNDRY SUPERVISION AND SALES

Old, established gray iron foundry wants man. Must know ni-hard process and application to mining industry. Supervise slinger and melting operations. Must have sales ability and knowledge to call on mines. Plant located in West. Send complete resume of experience, with picture, and salary requirements.

BOX 158 FOUNDRY

PENTON BLDG CLEVELAND 13, OHIO

SALES-SERVICE MAN

Excellent opportunity for highgrade man fully qualified in core and molding sand practices to sell and service our CERES and CERE-ATON cereal binders. Must travel. Good salary plus benefits. Fine advancement possibilities. Send resume to:

MR. PAUL STONE, ASST. TO PRESIDENT
ILLINOIS CEREAL MILLS, INC.
PARIS, ILLINOIS

• POSITIONS WANTED

CASTINGS SALES ENGINEER

Progressive salesman—15 years experience selling and servicing nonferrous castings. Sand permanent mold, diecasting. Familiar with all casting processes. Resume upon request. Address: Box 182, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOREMAN OR SUPERVISOR

17 years experience in nonferrous—cleaning, core making, molding, melting, gating and pattern layout. Progressive. Will relocate. Address: Box 180, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

COREROOM SUPERINTENDENT

Or general Coreroom Foreman. 19 years experience in gray iron foundry. Age 41. Married with family. Jobbing or production, bench or floor work. Qualified to take complete charge of all coreroom operations. Willing to relocate. Address: Box 184, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER

Progressive foundryman familiar with every phase of practical experience on all classes of work. Now employed. Would like to make change. Address: Box 185, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT-MANAGER

20 years experience as superintendent and manager of ferrous and nonferrous jobbing and production foundries. Practical knowledge of all departmental operations and costs. Good trouble shooter. Technical and sales background. Age 48. Address: Box 177, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRYMAN

Competent and progressive foundryman with good record desires to make change. Will relocate. Address: Box 155 FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY EXECUTIVE, MANAGER

EXCELLENT TECHNICAL AND PRACTICAL EXPERIENCE. FERROUS (INCL. DUCTILE IRON), NONFERROUS. METALLURGICAL ENGINEER, UNIVERSITY GRADUATE. KNOWS PROBLEMS OF EFFECTIVE ORGANIZATION. NOW EMPLOYED. AGE 45. DESIRES MORE RESPONSIBILITY AND CHALLENGE. JOBBING—PRODUCTION. LARGE OR SMALL CASTINGS. ADDRESS: BOX 178, FOUNDRY, PENTON BLDG., CLEVELAND 13, OHIO.

SUPERINTENDENT OR MANAGER

Practical and technical foundryman with fifteen years experience as superintendent and manager. Experienced in every phase of the foundry, plus sales. Will relocate. Address: Box 175 FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

DIRECTOR OF PRODUCTION—ASST. TO THE PRESIDENT

Thoroughly experienced in foundry and machine shop practices, tooling, and estimating. Government specs and contracts. Will accept any challenge to put my "know-how & knowledge" to work for your company, and prove my worth to you. Address: Box 169, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

COREROOM FOREMAN

Twenty years coreroom supervision. Experienced all types cores, steel and gray iron. Qualified to take complete charge. Any location. Address: Box 179, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Thorough knowledge of all phases of nonferrous metals. Understand gating, jobbing, floor, machine and plumber supplies. Can also produce pressure tight and porous free castings. Know sand control and core room work. Address: Box 161, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CLEANING FOREMAN—CHIEF INSPECTOR

20 years experience gray iron or steel. Good practical and technical knowledge. Now employed. Best references. Address: Box 165, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT

Practical gray iron foundryman technically trained, graduate metallurgist, 30 years broad experience producing quality iron, costs, jobbing and production. Light and heavy castings. Well versed in modern methods, cost minded aggressive, age 55, results obtained. Address: Box 162, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• EMPLOYMENT SERVICE

FOUNDRY PERSONNEL SPECIALISTS
National Placement and Procurement of
GENERAL AND PLANT MANAGERS, PLANT SUPERINTENDENTS, FOREMEN—ALL DEPARTMENTS, METALLURGISTS, ENGINEERS, CONTROLLERS, ACCOUNTANTS, SALESMEN, SALES MANAGERS, PERSONNEL DIRECTORS, PURCHASING AGENTS
Confidential Inquiries Invited
From Employers and Qualified Applicants
For Fast Competent Assistance Contact

DRAKE PERSONNEL, INC. **FINANCIAL 6-8700**
JOHN COPE, DIRECTOR, 29 E. MADISON ST., CHICAGO 2, ILL.

• POSITIONS WANTED

INDUSTRIAL EXECUTIVE

Experienced in all phases of selling and manufacturing at top management level. Graduate engineer; "C" process specialist; able administrator capable of establishing new division or profitably operating and expanding existing facility. Married, age 45. Presently located midwest but willing relocate home or abroad. Address: Box 153, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER

Practical foundryman nationally known for a job well done. Age 47. Good health. Now employed. Looking for more action ferrous or nonferrous, $15,000 minimum. Address: Box 145, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER-SUPERINTENDENT

Age 43, 27 years experience in all phases of gray iron foundry, practical and technical, proven ability in ductile and high strength gray irons basic and acid cupolas, jobbing or production. Address: Box 157 FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

GENERAL FOREMAN CLEANINGROOM

Thoroughly experienced in all phases of cleaningroom operations. Now employed. Wishes to relocate. Would like position with future. Have good cost-quality, labor-relations record. Resume upon request. Address: Box 171 FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT MANUFACTURING

Graduate foundryman experienced in all phases of gray iron mechanized foundry operations, up-to-date on latest developments and methods, cost and quality minded, now employed, desires relocation including overseas assignment. Address: Box 147, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MOLDING FOREMAN

Young, aggressive molding foreman with some coreroom experience desires position with future for advancement. Apprenticeship and journeyman time in steel, supervisory experience in meehanite, gray iron and ductile. Willing to relocate. Address: Box 166, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER

Practical and technical foundryman with 28 years experience in conventional or highly mechanized foundries. Graduate in mixing and melting of iron, cupola practice and metallurgy. Excellent sand control. Address: Box 164, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

GENERAL MANAGER

Practical gray iron foundryman, with 25 years experience in management, labor relations, production control, metallurgy of gray iron and ductile, and sand control. Married. Age 47. B.S. degree in engineering. Immediately available. Midwest area preferred, but will relocate. Excellent references. Address: Box 163, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

EUROPEAN FOUNDRYMAN

Living in Canada. Age 49, married, 3 boys age 21, 18, 14. 34 years experience in iron casting, 13 years as superintendent and foreman. Best knowledge of all foundry operations. Seeks position in medium or small jobbing foundry. Address: Box 172 FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERVISOR

Twenty years experience all phases of foundry supervision. Mainly malleable but experienced also in gray iron. Available soon. Address: Box 170 FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• REPRESENTATIVES WANTED

SALES REPRESENTATIVES

Here is an established competitively-priced line you can count on for a good income. Milward Alloys, a leading manufacturer with a strong reputation is now in the process of localizing many sales areas to give better service to customers and prospects from coast to coast. A considerable number of territories are open. We need men who will take them on, full or part time.

You may now be serving the trade or you may have foundry experience. Maybe you're retired with time on your hands. Regardless of your situation, you will be amply rewarded—because Milward's line is broad and in constant demand. Milward alloys cut foundry costs. Orders are promptly filled. That's why we have a substantial reorder business.

The Milward line includes: copper shot; phosphor copper and other powerful deoxidizers and degasifiers; aluminum bronze and manganese bronze hardeners and ingots; copper silicon, copper manganese, copper iron, copper aluminum and copper chrome alloys; nickel copper and nickel iron alloys; aluminum titanium, aluminum silicon, aluminum manganese, aluminum iron and aluminum copper and other alloys.

Phone or send us a letter describing the area or locality you can cover, whether full or part time, and tell us a little about yourself . . . your qualifications, experience, and when available. This may well be the connection you've been waiting for. Write or phone: Mr. David B. Milward, President. Phones: Lockport, N. Y. 4-0435, or Buffalo, N. Y. LUdlow 6425.

MILWARD ALLOYS, INC.

Lockport, N. Y.

• ENGINEERING SERVICE

PERMANENT MOLD METHOD AVAILABLE THE WAGNER PERMANENT MOLD CO., 2910 Empire Ave., Burbank, California, has developed a Permanent Mold Method for ferrous and nonferrous metals and invites inquiries from any country regarding this method and process.

MAGNESIUM PERMANENT MOLDS

Designed and gated. Address inquiry to: Box 144, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• FOUNDRY CONSULTANTS

FOUNDRY CONSULTANT-NONFERROUS

Sand casting—permanent mold casting—centrifugal castings — in aluminum — brasses — bronzes —30% leaded bronze—aircraft quality bearings and castings. Address: ED JENKINS, 286 PENOBSCOTT BLDG., DETROIT 26, MICHIGAN, PHONE: WOODWARD 5-7947.

• FOUNDRIES WANTED

WANTED

We would like to purchase gray iron, malleable or steel foundry. Must have sales from 20 to 50 tons per day. Prefer Ohio location, near or around Cleveland. Will consider others. Equipment and building unimportant as long as good sales volume exists. Will pay cash or trade for stock on New York Stock Exchange. Address: Box 167, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• FOUNDRIES FOR SALE

ALUMINUM, BRASS, BRONZE, MAGNESIUM

Foundry for sale. Not far from southern California area. Producing vital castings top defense program, for leading U. S. industries. 18,000 sq ft building. Owner retiring.

BOX 181, FOUNDRY

PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY FOR SALE

Fully equipped now operating gray iron foundry in western New York State for sale. Located near the New York Power Development. Reason for selling, present owners want to retire.

BOX 173, FOUNDRY

PENTON BLDG. CLEVELAND 13, OHIO

FOR SALE

Eastern Pennsylvania gray iron foundry. Profitable operating—partly mechanized. Pouring 100 tons per day. Building 30,000 feet on 80,000 foot property. Owner retiring. Write to: DANVILLE FOUNDRY CORP., DANVILLE, PA.

ALUMINUM AND BRASS FOUNDRY

For sale. Fireproof building 7200 sq. ft. In profitable operation, bluechip customers of long standing. Vicinity of Milwaukee, Wisconsin. Address: Box 160, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOR SALE

Gray iron jobbing foundry located in S.W. Ohio industrial community. In operation for 34 years. Owner to retire. Not too much capital necessary. Address: Box 176, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• WANTED-TO-BUY

SPECTROGRAPHIC EQUIPMENT

and other laboratory equipment. Will buy. Write full details:

JAMES W. WELDON LABORATORY

2315 HARRISON STREET

KANSAS CITY 8, MISSOURI

WANTED

2 used cranes—15 ton capacity hoist—30 ft. lift—38'7" span—wheels to run on 35 lb. rail—3/60/220—AC current. Maximum wheel load 25,000 lbs. 125 ft. minimum trolley speed. 25-300 ft. min. bridge speed—magnetic controls. 25-30 ft. min. hoist speed. Mail complete description and offer to: J. A. Graham, The Dayton Steel Foundry Company, P. O. Box 1022, Dayton 1, Ohio.

WANTED

Used or Broken Silicon Carbide Grinding Wheels of any kind or size, regardless of bond. Will pay $35.00 per ton. Union Mining Co., 1st Nat'l Bank Bldg., Pittsburgh 22, Pa.

• WANTED-TO-BUY

WANTED

One good used late model #3, 3H or 3F Simpson Mixer — complete. Address: Box 152, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MIXER WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price for immediate acceptance. Address: Box 148, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• FOR SALE

SAND BLAST EQUIPMENT
SELL-BUY-TRADE
GUARANTEED MACHINES
TERMS: 3 YEARS TO PAY

6' LF-14 Pangborn Table	$2200.00
9' LG-14 Pangborn Table	4500.00
6' Pangborn Swing Table	6000.00
Rumelin 8 x 8 Room	1200.00
Pangborn 53 EN2 Hand cabinet	325.00
Pangborn Auto Peening cabinet	1100.00
14 LG5 Pangborn Multi-table 5—5' tables	9000.00
48 x 48 Wheelabrator Tum. w/loader	5000.00
42 x 48 Wheelabrator Tum. w/loader	3500.00
27 x 36 Wheelabrator Tumblast Like new	3500.00
Skiphoist—For all Wheelabrator Tumblast	
8' Wheelabrator Table Blast	2500.00
6' Wheelabrator Table Room	6000.00
Pressure Tanks, all types	150.00 up
Vapor Blast cabinets	400.00

All types and sizes of Hand Cabinets, Dust Collectors, Pressure Tanks, Rooms, Horizontal or Vertical Tumbling Barrels and additional Sand Blast Equipment too numerous to mention.

DIAMOND SALES, INC.
5654 W. Jefferson
Detroit 9, Michigan
VI-3-6750

FOR SALE

MELTING FURNACES

$200.00 each—F.O.B. Arkansas

Dimensions: Outside — 34½" diameter x 35" deep
Inside — 21½" diameter x 31" deep

Units complete including lining, thermocouple and protection tube, Hauck #780 Proportioned burner assembly—Burner, oil pressure regulator, oil filter, oil pressure gage, micro-regulating valve, oil shut off valve, air shut off valve.

Manufacturer—Hausfeld.

Designed to hold 130 pounds of Magnesium.

21 units available.

SABIN METAL CORP.
310 MESEROLE STREET,
BROOKLYN 6, NEW YORK

WILL SELL OR TRADE

MOORE Rapid Lectromelt Steel Melting Furnace 1. Type 4 2. Size U 3. Direct 3 phase Arc Manufactured about 1940
Nominal rating—250#/hour 40" shell
Will make 500# charge or greater
225 KVA transformer, 3 phase, oil insulated, water cooled Westinghouse, 2200V to 191V, 60 cycle.
Also included are a D.C. Generator (230 volts) for operating the electrode motors, and a control panel (Westinghouse Automatic Arc Regulator) coupled with a West. Clapper board.

PEK MACHINERY COMPANY
1054 GARFIELD AVE.
JERSEY CITY, N. J.
HE 2-2898

FOR SALE

Several 9" International Type P.J.S. Molding Machines.
Several 110-1 SPO Portable Jolt Squeeze Molding Machines.
One Dependable 200 series Shell Core Machine. Used less than 100 hours.

J. E. GILSON COMPANY
349 W. WESTERN AVENUE
PORT WASHINGTON, WISC.

• FOR SALE

FOR SALE

CLEARFIELD #404 Muller 4 cu. ft.
SIMPSON #0 Muller Style UD w/air discharge
MILWAUKEE Jolt Pin Lift 30 x 60 Table
TABOR 7½ HP abrasive Cut Off Saw
REDFORD #2 Core Blower w/air clamps
DEMMLER #1 Core Blower (never used)
SCREENERATOR MODEL M
SCREENERATOR MODEL S
TABOR Jolt Hand Rollover 20 x 22 Table
3—SPO 113J Jolt Squeezers
NB4 Royer
MODERN Pouring Devices F9
LINDBERG 6' x 8' x 8' Al. Heat Treat Furnace complete with controls, etc.
SIMPSON Porto Mullers
We will buy one piece or a complete plant.

PEK MACHINERY COMPANY
1054 GARFIELD AVE.
JERSEY CITY, N. J.
HE 2-2898

FOR SALE

Royer sand preparator, 3 five ton bottom pour ladles, Champion model BK brick saw; large IR air compressor (disassembled); 90 KW DC generator, synchronous motor; Leitz-Biosjo carbon meter. We want 3 ton teapot, tensile tester, hoists, etc. Write what you have to trade: P. O. BOX 458, LEEDS, ALABAMA.

FOR SALE

2—Model TD4 Taccone Molding Machines (automatic)
2—#9 Whiting Cupolas with Modern Swivel Type charger. Above equipment slightly used.
Address: Box 156 FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOR SALE

Newaygo "Reddy-sandy" Mod. RS-VM, complete
Bucket Elevator on 20' centers 22—6" x 10" buckets
Eclipse Reverberatory Furnace Model F2000G
Skip Hoist for No. 9½ Cupola
Osborn #405 Rollover
Vibrating Screens
International Rollover RES, Size 15"—6"
Milwaukee 163 Jolt Stripper
Champion JSL 12 Pin Lift, Jolt
Osborn 710J, Pin Lift
Osborn 212J, Jolt Squeezers
Osborn 275J, Jolt Squeezers
SPO 113 Jolt Squeezer
International LSJ, Jolt Squeezer
International PJS, Jolt Squeezer
Milwaukee 104 Jolt Squeezers
Champion JS 108 Jolt Squeezer
Arcade 100S Jolt Squeezer
SPO 506 Jolt Rollover, Pin Lift, Draw
SPO 110 Jolt Squeezer
International Rollover 24-10 G, Portable
International Rollover 30 x 8, no jolt
International Rollover 30 x 12 G.
International Pin Lifts
Davenport Pin Lifts
Osborn 559 Pin Lifts
International Type R core rollover, hand
Swing Grinders
Royer Sand Preparators
B & P Preparators
Blystone Sand Mixers
American Sand Cutters, Model M
Core Ovens
Grinders, ½ hp to 25 hp
Disc Grinders
Ladles from 50-5,000 lb.
Pouring Devices, 500 lb. to 2000 lb.
Gyratory Riddles
Tramrail & Switches
Air Hoists, 1000 lb. to 4000 lb.
Overhead chain conveyor #458, track, drives
Blowers—Centrifugal—positive—exhaust
17", 20", 28", 36" Spray Booth Fans
Spencer Turbo Compressor, 3600 CFM @ 24 os., 40 Hp. Motor
AAF Dust Collector, Type N, Size 1½, Wet
AAF Dust Collector, No. 40 Air Mat Dust Arrestor
Spencer Centrifugal Dust Collector, Multiple Vacuum Type, 300 CFM @ 5" of Hg., Vacuum
Turner & Hawes Dust Collector, Atmospheric Dry Filter Non-Automatic Type, Size 2500
Pangborn Dust Collector, Cloth & Screen Type Size 11,000 CFM

FLASKS
ALUMINUM
SLIP AND POP
SIZES FROM 10" x 10" TO 48" x 48"
JACKETS
ALUMINUM AND IRON
STEEL FLASKS
CORE PLATES
TRANSITE—IRON
MANY OTHER ITEMS IN STOCK
SEND US YOUR INQUIRIES
WE BUY—SELL—TRADE

THE HOMAN MACHINERY CO.
1144 HARRISON AVE. MAIN 1-0330
CINCINNATI 14, OHIO

• FOR SALE

FOR SALE

Pangborn ROTABLAST table 9 LG 14 with 8-28" multi tables.
Wheelabrator CABINET will clean inside or outside. Pipe channels, castings up to 12". Never used.
TABOR 10" Molding Machines—$80
TABOR 10" Jolt Pin Stripper—$250
WIRE CUTTER 3/16—¼ maxim—$125
DUST COLLECTOR Pangborn 12000 CFM
DUST COLLECTOR Pangborn 2500 CFM
DUST COLLECTOR Uniwash Newcomb Detroit 5600 CFM
BURRING BOOTH magnesium with 4 stations.
American AIR FILTER 2500 CFM sludge type
Pangborn EN2 CABINET suction type
FLASKS 50" x 40"—$60

M. ELSTEIN
426 GRAND ST.
JERSEY CITY 2, N. J.

FOR SALE

Core Blower—Sand Blo—used very little, in good condition.

COLUMBIANA FOUNDRY COMPANY
COLUMBIANA, OHIO

FOR SALE
MOTOR—GENERATORS
TRANSFORMERS
Unused—Rebuilt
WORLD'S LARGEST INVENTORY
ELECTRIC EQUIPMENT COMPANY
Phone station Collect GLenwood 3-6783
P. O. Box 51—Rochester 1, New York

• FOR SALE

FOR SALE

SHAKEOUT Hewitt-Robins 3' x 4', good condition, very low price.
CHEMICAL LABORATORY EQUIPMENT inc/-steel furniture (complete) ready to run iron and steel analysis—also complete Dietert Sand Testing Equipment.
INTERNATIONAL (2) type F & type G Jolt-Rollover-Pattern Draw—good.
WHEELABRATOR TUMBLAST (2) one 48 x 42 and one 48 x 72. Both good ones.
Other good equipment.

W. O. McMAHON
BOX 5799, HOMEWOOD STATION
BIRMINGHAM 9, ALABAMA
PHONES TREMONT 1-2088 or 9-6170

AJAX 30KW INDUCTION FURNACE

Air cooled M.G. set, 1.0 power factor, 3600 R.P.M., 400 volts, 4200 cycles, driven by 50 HP, 220/440 3 phase, 60 cycle induction motor. Serial No. P19855. Also includes manual reduced voltage motor starter 50 HP, 220 volts. One year old and in excellent condition.

NATIONAL METAL & FOUNDRY
PRODUCTS CORP.
21-24 44th Avenue
LONG ISLAND CITY 1, N. Y.

FOR SALE

1—Simpson #0 Muller—Style M (never used)
1—Simpson 18" Muller
1—Lancaster Mixer, Model EBG-4
1—Lancaster Mixer, Model EAG-3
1—Ingersoll Rand Air Compressor, Type PRE-2, 24" x 16", 100# pressure with 300 HP Motor.
3—Link Belt Roto-Louver Rotary Dryers, Models, 207-10, 310-16, and 604-20.

R. GELB & SONS, INC.
U. S. HIGHWAY 22, RAHWAY VALLEY R. R.
UNION, NEW JERSEY

• FOR SALE

REPAIR AND REBUILDING SERVICE ON
ALL PNEUMATIC TOOLS

We try to carry a complete line of "Hard Chrome Rebuilt Tools" at about half the cost of new tools. Before you discard your old tools, why not send them to us for our estimate on the cost of renewing them with our Hard Chrome Process?

CENTRAL PNEUMATIC SERVICE, INC.
512 LINDEN AVENUE
DAYTON 3, OHIO
PHONE: CL 2-2701

FOR SALE

Wheelabrator Tumblast, 48" x 48" Ser. #A33934 with loader and electrically operated door. $3700. Loaded on car or truck.

THE NATIONAL FOUNDRY & FURNACE CO.
DAYTON, OHIO
BAldwin 8-7138

GANISTER QUARRY TO LEASE OR FOR SALE

30 acres of an unlimited deposit of a high grade refractory ganister, located in the southeastern part of Wisconsin. Quarry opened up and fully developed and ready for operation. Ample storage, loading and track facilities. Will consider leasing the quarry and track property to a responsible contractor who is financially capable to install the necessary equipment to quarry, crush and screen our ganister. Will contract for a substantial tonnage for all year round shipments.

PORTLAND QUARTZITE CO. INC.
126 N. AUSTIN BLVD.
OAK PARK, ILLINOIS
PHONE VILLAGE 8-4069

HN

"FOUNDRY EQUIPMENT BY FOUNDRYMEN"

. . . a trademark to remember a name to trust . . .

HAMLIN-NAGEL, INC.

BOX 192 EDWARDSVILLE, ILLINOIS
in Metropolitan St. Louis

COMPLETE SIXTEEN STATION SAND SYSTEM INCLUDING MOLD CONVEYOR.
MODERN CUPOLA CHARGING SYSTEM FOR TWO CUPOLAS W OR W/O CUPOLAS

JOLT SQUEEZERS
International PJS-16"
International LJS-10"
Osborn 275JW
SPO 110J
Tabor Top Squeezers

JOLT SQUEEZE ROLLOVER DRAW
SPO 920
SPO 4130
Osborn 332

JOLT ROLLOVER DRAW
International F
International G 30 x 12
SPO 508
Tabor 30 x 50
Tabor 12 x 22
Osborn 242W
Herman 40 x 60—10,000#

JOLT PIN LIFT
Davenport 34A
Osborn 559
Milwaukee 1536

JOLT SQUEEZE PIN LIFT
Osborn 716PJ
Osborn 712PJ
Milwaukee 126

MULLERS
B&P 60—Multrelmatic
B&P 40—Skip
Simpson #2 Skip & Aerator

AIRLESS BLAST EQUIPMENT

Wheelabrator 48 x 72 with skip and dust collector, excellent condition.

Wheelabrator 27 x 36 with skip.
Wheelabrator 42 x 48 with skip & collector
Wheelabrator 36 x 42 with skip & collector
Pangborn #3 continuous with feeder & collector

CORE BLOWERS

Demmler 103EO, skip, feeder & automatic cycle
Demmler 3EO, feeder & semi-automatic cycle

Demmler #1 & 2
San Blo CB-40-D-LPP
Redford #1 & 2
Champion CB5, CB8 and CB15 (Never used.)

CORE OVENS
Coleman 39' tower combination oil & gas
Porbeck double end gas or oil

SAND CONDITIONING AND HANDLING
Screenarators "M" & "L"
Royer NDP
American Sand Cutters — various sizes.
Bucket Elevators
Troughing Conveyor 16" x 34' w or w/o magnetic pulley.
H-R Oscillating Conveyor 36" x 60' year 1956.

MATERIAL HANDLING
Hough HA Payloaders
Forklift Trucks and Handling Boxes
1 Yard Clamshell Bucket
1½ Yard D.C. Clamshell Bucket
Hoists Air and Electric
Crane Magnets 45" and 50"

METAL HANDLING
Ladles 250#—10,000#
Pouring Devices, various capacities
Motorized Ladle Carrier
12" Cleveland Tramrail

AIR COMPRESSORS
10, 15 & 40 hp water cooled
175 hp synchronous, 2 stage IR-XRE

MISCELLANEOUS EQUIPMENT
Foxboro Air Weight Controllers
Grinders, 18" x 24"
Detroit Hardness Testers
Flasks, Steel, various sizes
Flasks, Aluminum Slip
Jackets, Aluminum & Wopper Jaw
Core Plates—Aluminum & Transite
1½ Yard DC Clamshell Bucket
Cupolas, various sizes
American Core Rod Straightener

42" Bullard "New Area" VTL lathe with side head
52" Betts Boring Mill with two loading arms.

FOUNDRY ENGINEERING SERVICE
WANTED! GOOD SURPLUS EQUIPMENT

Circle 875 on Page 53

AAA MACHINERY & EQUIPMENT CO.

over 1000 satisfied customers

WORLD'S LARGEST INVENTORY OF GUARANTEED FOUNDRY EQUIPMENT

AIR & ELECTRIC HOISTS

85—I & R Air Motor type, sizes A, B, C, D, D-6 & E, ½, 1, 2, 3 & 5 ton.
15—DETROIT Air Hoists, 1, 1½, 5ton cap.
1—DETROIT Model LHR, 5 ton, elec.
20—THOR air hoists, ½, 1 & 2 ton cap.

BUCKET ELEVATORS

12—LINK-BELT & JEFFREY, 30, 40, 50, 60 ft. cc, 10 x 7, 12 x 7, 14 x 7, 16 x 8 buckets.

CUT-OFF MACHINES

1—TABOR C10AF, 16" wheel, 10 HP.
3—TESSEMER H & I Sprue Cutters.

CORE BLOWERS

3—CHAMPION Model CB-10, CB-18, & CB-400. From 10 to 300 lb. Cores.
22—DEMMLER #50 Model 1, 1E, 2, 2E, 2K, 3, 3E, 3K, 4 & 4E. 10 to 100 lb.
1—FEDERAL 40P-1 San-Blo.
7—INTERNATIONAL Model SB-11 & SB-13, SB-15H, 15 to 30 lb. Cores.
6—OSBORN Nos. 91, 92, 192 and 193. From 10 lb. to 75 lb. Cores.
2—REDFORD #2—Magazine type.
1—SAN-BLO Model CB-40-B, 40# Cores.
1—SPO Model SC-10-DM, hollow core.

CORE OVENS

1—INDUSTRIAL "Revolving Carriers" continuous, 18" x 80" trays.
2—PORBECK Batch type 10' L x 8' W.
1—DESPATCH Type "S" 6' w x 16½' l x 7½' h Oil Fired.
1—FOUNDRY EQUIP. 3 comp. 6' x 7' x 12' ea. Gas or oil.
1—THERMONIC Model M800A Dielectric. Cap. 900#s per hour.

CUPOLAS, BLOWERS & EQUIP.

1—SPENCER 150 HP 7500 CFM 48 oz.
6—I & R Centrifugal 30, 50, 85 and 100 HP. 3500 to 10,500 CFM w/blast gates.
1—CUPOLA Bondactor, style 1205-L.

ROTO-CLONES WET TYPE

9—AMERICAN AIR FILTER Type N&W, Sizes No. 20, 24, 27, & No. 30, w/sludge ejectors, cap. to 30,000 CFM.

ELECTRIC MELTING FURNACES

4—DETROIT LFA, 350# Cold Charge 700# Molten w/200 KVA transformers.
1—TOCCO 20 KW Induction, 9600 cycles.
3—AJAX No. 100 & 300 Furnaces Only.
6—AJAX 35 KW Induction 460 V 1 phase.
1—DETROIT Size CM—4000# Charge, 8000# Molten, w/1000 KVA trans.
2—AJAX 20 KW Hi Frequency Converters.

GAS & OIL FIRED FURNACES

23—LINDBERG FISHER Model MNP electric Tilt. Sizes 150, 400, 600, 1000, 1700, 2000 & 2400#, alum. cap. Gas or Oil.
29—LINDBERG & HAUSFELD Stationary. Sizes 100, 150, 200 & 550 cap.
1—LINDBERG #400 BBI hand tilt.
1—SKLEENAR 1200# Rev., hand tilt.
1—MONARCH 600# Rev., hand tilt.
1—STROMAN, "U" 600# Reverb.
1—STROMAN DC "Dipout" 800# cap.
1—ECLIPSE E1000—Double Chamber Dry Hearth 1000# cap.

GRINDERS

Swing Frame

1—FOX #4 Wheel 24" x 3"—20 HP
1—MARSCHKE 20" x 10" wheel, 10 HP.
3—MARSCHKE 24" x 3" wheel, 15 HP.
2—U. S. ELEC. Model 24, wheel 24" x 3".
1—MUMMERT-DIXON #2420, wheel 24" x 3".

Snagging

4—FOX #7—30" x 3" Wheel, 15 HP.
2—U. S. #64, 20" x 3", 7½ HP, 4 speed.
2—SAFETY #174, 24" x 3" wheel, 10 HP.
2—MARSCHKE 24" x 4" wheel, 20 HP.
1—U. S. #65, 30" x 3", 15 HP, 4 Speed.
U. S. No. 62VS, 24" wheel, 2-7½ HP motor, variable speed.

Core

2—MILWAUKEE 70-12, 70" dia. table.
1—STONEY Core Grinder, 16" dia. Wheel.

Horizontal Disc

GARDNER No. 124—53" wheel, 20 HP.
GARDNER No. 179, 70" dia. wheel, 40 HP.

LADLES

17—MODERN & WHITING Cylindrical Ladles, 275, 2450, & 3000 lbs. capacity. All Enclosed Gears.
37—MODERN & WHITING Lip Pour, Enclosed Gear, 1200, 1600, 2000, 4000, 6000, 7000, 8000 lbs. capacity.
7—MODERN & WHITING Mixing Ladles, 2 & 3 ton. Electric & Manual Tilting.

MOLDING MACHINES

Jolt Squeezers

12—OSBORN No. 275-J—17x20 Table, 10"
15—OSBORN No. 276-J—17x26 Table, 13"
2—OSBORN No. 216-PJ—21-32 Table, 16"
6—MILWAUKEE 123—17x26 Table, 12"
2—MILWAUKEE 181—24x36 Table, 18"
10—INT. PVJS—20x26 Table, 12" cyl.
9—SPO No. 110-J—17" x 20" Table, 10"
8—SPO No. 113-J—17" x 26" Table, 13"

Plain Jolt

1—J&J 50 x 72 Table—5000# cap.
2—OSBORN 60" x 72" table, 6000# cap.
1—TABOR 36" x 36" table, 1000# cap.

Jolt Rollover Pattern Draw

1—DAVENPORT 28A, 28" x 44" table.
1—DAVENPORT 28-8A, 29" x 40" table.
2—HERMAN 20" x 30"—750# series.
2—HERMAN 26" x 48"—1500# series.
2—HERMAN 50" x 60"—300# series.
2—HERMAN 40" x 48"—400# series.
1—HERMAN 60" x 84"—6000# series.
1—HERMAN 60" x 84"—10,000# series.
14—INTERNATIONAL TYPE G, Sizes 20" x 8". 24" x 10", and 30" x 8".
1—J & J #920 RC—44" x 54"—Hyd. head.
1—J & J #1020 RC—50" x 60"—Hyd. head.
2—J&J #612, 24" x 30" Table.
4—J&J #918, 44" x 54" Table.
1—J&J #815-B, 30" x 40" Table.
1—MILWAUKEE #167, 32" x 33" Table.
10—OSBORN #40 and 42 Core Rollovers.
1—OSBORN #442, 21" x 31" Table.
2—OSBORN #242W, 29" x 42" Table.
12—OSBORN #601 & 602, 30" & 36" Wide Flask, 10" draw, 750 lbs Cap.
2—OSBORN 643 Table 35" x 50"—2000#.
1—SPO No. 9546—26" x 32" Table.
1—SPO No. 917-A—40" x 29" Table.
1—SPO #413D, 24" x 25" Table.
1—SPO Model 508, table size 28" x 30".
1—SPO 5050, Table 25" x 30", 10" draw
3—TABOR 30" x 40" Table, 12" Draw.
4—TABOR 22" x 42" table, 10" Draw.

Jolt Pin Lift

2—DAVENPORT #34 AJS.
3—INTERNATIONAL JDP 1600 x 10" draw, 36" x 36" Table.
2—INTERNATIONAL JDP 3000# x 10" Draw 48" x 48" table.
1—J & J #8125—30" x 38" Table—10" draw.
1—MILWAUKEE #2542.
2—J & J No. 688 25" x 30" table, 6" draw.
2—MILWAUKEE No. 1030—30x38 Table.
1—MILWAUKEE No. 1536 32x38 Table.
3—MILWAUKEE No. 3548—44x48 Table.
2—OSBORN #559, 25" x 30" table.
1—SPO #3058, 22" x 28" table, 8" draw
2—SPO #3070, Table 26" x 35", 10" draw

Pin Lift

2—B & P Model AL 2428 Speed Draw.
1—MILWAUKEE #620 ND Push
2—MILWAUKEE No. 195.
2—INTERNATIONAL #PK-16.

Jolt Squeeze Pin Lift

1—MILWAUKEE #125, 21" x 27" Table.
3—MILWAUKEE No. 165, 24" x 30" table.
3—MILWAUKEE #196, 17" x 38" Table.
1—OSBORN #712-V, 18" x 26" Table.
2—OSBORN #710-J, 17" x 21" Table.
9—OSBORN 714PJ, 20" x 31" Tables.
1—OSBORN #818—24x36 Table, 18" cyl.
1—MILWAUKEE #246—23¼x42 Table.
4—INTERNATIONAL PKL, 17" x 26".
1—SPO #2136-6.
2—SPO 2114P, Table 21" x 27", 11" cyl.
2—SPO 2160-R, Table 24" x 30", 16" cyl.

Shell Molding

1—SHALCO, Model HO4, 2 station.

CONVEYORS

Steel Apron

9—JEFFREY & LINK-BELT 24", 30", 36", widths. Lengths built to your specifications, with reducers & motors.

Oscillating & Vibrating

1—LINK-BELT 48" x 154', 20 HP Motor.
7—JEFFREY TAYLOR No. 5 Vibrating Feeders 24" wide x 7'.
LINK-BELT "FLEXMOUNT"
1—8" W x 50' L x 4" deep pan
2—18" W x 18' L x 4" deep pan
2—SIMPLICITY 24" W x 13' L x 6" Deep.
1—SIMPLICITY 18" W x 11' L x 6" Deep.
1—SIMPLICITY 24' w x 19' x 6".

Roller

2500' MATHEWS 6", 14" wide, 2⅞" dia. roller, 1" hex shaft, 4" channel.
1500—MATHEWS 8" wide, 3½" dia. 1" hex shaft on 6" centers, 6" channel.

Mold

1—DUO-ROLL 88 Cars 20" x 48", 350' track, with automatic dumping.
1—PALMER "B" 106 Cars—42" x 62" w/550' Track.

Belt

LINK-BELT & JEFFREY 18", 24" & 30" wide. Flat or trough idlers, all Timken bearings. Built to your specifications. Can be equipped with molders hoppers & Ploughs.

HOPPERS & STORAGE BINS

1—NATIONAL ENGINEERING "Moulders Helper" 2 Hopper Unit.
7—NATIONAL & LINK-BELT Storage Bins, 60 to 150 tons cap.
1—NEWAYGO HS-7-GT, Handy Sandy.
42—MOLDERS Hoppers 1½ ton cap.

SAND MULLERS

3—B & P No. 80A Speed Muller—24 cu. ft. air cooled.
1—B&P #3½ Mulbaro, 3½ cu. ft.
1—B&P #30 Speedmullor, 4 cu. ft., w/skip Hoist Loader—Air Cooled.
1—B&P #50 Speedmullor, 9 cu. ft., w/skip Hoist Loader—Air Cooled.
1—B&P #60 Speedmullor, 12 cu. ft., w/skip Hoist Loader—Air Cooled.
1—B&P #70 Speedmullor, 18 cu. ft.
1—BESSER Paddle Type, 30 cu. ft.
1—CINCINNATI 24" muller.
2—CLEARFIELD No. 610 w/skip hoist loaders, 10 to 14 cu ft batch.
1—CLEARFIELD #404, 4 cu. ft. batch.
1—DRAVO-DOYLE 6 cu ft cap. Port.
1—LINK-BELT 48" x 8' Paddle Type.
2—MASTER 400# Shell Type 5' pan dia.
1—PEKAY No. 160-1-24 Mixer Muller, single stage for 24" belt, 230 TPH.
1—SIMPSON #1-H Style UD, 400# batch
2—SIMPSON #1½ style UD, 700# batch w/loader.
2—SIMPSON #2, Style C, 1500# w/loader.
3—SIMPSON #3, Style C, 3000 lb.
3—SIMPSON #3, Style UD, 3000 lb.
2—Mixer Muller, 6 cu ft paddle type.
1—LANCASTER No. EDG-4, 5 cu. ft.
1—LANCASTER #EA-4, 6 cu. ft. w/loader.

SAND PREPARATORS

6—B & P Screenerators, Models S, M & L.
8—ROYER Models, NC-4, NDS, NDP.
6—AMERICAN Sand Cutters, Model M, Sizes 79/60, 89/70, 99/80. All late.
4—AMERICAN Model AA and AM, 45" & 60" Cutting Blade.
1—AMERICAN "Sand Master," 102"/70" Cutting Blade—1952.
2—MOULDERS' FRIEND 50" & 60" Brush.
2—NEWAYGO RS-V Reddy Sandys.
1—SIMPLICITY LP 2' x 3' screen.

SANDSLINGERS

1—B&P 5-ton capacity Plate Feeder
2—B & P Tractor Type 19" head & 16" head, 13' arms. Magnetic towers.
6—B & P Models DB Stationary Sand Slingers, 16", 19" and 22" heads, with 20, 25, 40 and 50 HP motors. All late.
2—B & P Swing Type Slingers 19" head.
4—B & P 8 ton plate feeders.
2—B & P 35 ton capacity plate feeders.
6—B & P Tanks for speed slingers.
1—B&P Motive 15' Jib—6' Ram—19".
1—B&P Motive Jr. 8' Jib—4' Ram—19".

SHAKEOUTS & SCREENS

2—LINK-BELT 5' x 10', 6 ton cap.
3—SIMPLICITY 4' x 6' Model B.
1—SIMPLICITY 4' x 8' Model D.
1—SIMPLICITY 4' x 10' Model D.
1—SIMPLICITY 5' x 8', Model D.
1—NATIONAL ENG. 5' x 8' Hex Screen.
1—HEWITT-ROBINS 36" x 78" Vibrex.
1—SIMPLICITY 4' x 10' Model B, Single deck sifter screen, 10 HP motors.
2—ROBBINS 3' x 4' JF6—2000#.
1—ROBBINS 6' x 10' JF11—20,000#.

SAND BLAST EQUIPMENT

2—AMERICAN 36" continuous Tumblasts
1—AMERICAN 36" x 42", w/skip hoist.
2—AMERICAN 48" x 42", w/skip hoist.
1—AMERICAN 27" x 36", w/skip hoist.
1—AMERICAN 48" x 48", w/skip hoist
1—AMERICAN 48" x 72" w/loader.
1—AMERICAN No. 2 Tablast—6' dia. Plain Table.
1—AMERICAN #3 Tablast, 4—48" tables.
1—PANGBORN Model 8-LP, 6' diameter plain table with dust collector.
1—PANGBORN 6 LG-14 Multi-Table, 6-24" tables, w/dust collector.
1—PANGBORN Model 14GK-7 Roto-Blast barrel w/loader.
1—PANGBORN 9LG-14 Multi-Table w/6—36" dia. Aux. Tables w/Dust Collector.

AAA MACHINERY & EQUIPMENT CO.

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A great name AAA grows greater!

Now introducing to the foundry industry "IFCO" Industrial Furnace Co. Division of AAA Machinery and Equipment Company.

Through expansion and progressive management, IFCO now gives you the same dependable and competent services as AAA's foundry equipment division.

IFCO Division, headed by Dennis Hynes, promises to bring a new measure of value to AAA's highly respected name, with services expanded to cover a vast multitude of heat treating and melting equipment, thoroughly modernized and definitely in step with today's demands.

You can be sure that AAA and it's IFCO Division will continue to be your most important source for REBUILT machinery and equipment to give you maximum value, performance, and economy.

LOOK TO AAA

If there is a better way

HERE'S HOW TO RETAIN MORE OF YOUR HEAT TREAT SALES DOLLAR WITH IFCO

USED, REBUILT & NEVER USED HEAT TREAT FURNACES AT SAVINGS UP TO 60% OF NEW EQUIPMENT

GRAY IRON ANNEALING FURNACES

PUSHER

58" x 31" x 48" E.F.C. 250KW w/preheat 1650° F.

50" x 34' x 12" G.E. 238KW 1750° F. For use w/controlled atmosphere. Includes work trays & (1) 1500 CFH G.E. Exothermic Generator. 2 available. Excellent condition.

ROLLER HEARTH

50" x 25' x 18" Westinghouse 240KW 1550° F. For use w/wo protective atmosphere.

53" x 30' x 27" Stewart Sunbeam 750KW 1550° F Complete w/8500 CFH atmosphere generator. Like New condition.

MESH BELT

20" x 10' x 12' Surface Combustion, gas fired, 1650° F.

54" x 25' x 27" C. I. Hayes 198KW 1650° F. For use with or without protective atmosphere. Like New condition.

BELL

36" dia. x 72" H Westinghouse 120KW 1500° F. Complete w/2 B&R. & Ammogas Generator.

59" dia. x 50" H. Westinghouse 100KW 1400° F.

ELEVATOR

2' x 10' x 4' G.E. 200KW 1650° F.

7' x 14' x 7' G.E. 700KW 1650° F.

CAR BOTTOM

5' x 12' x 3' Johnson 1650° F., gas fired, w/2 cars'.. Brand New.

ALUMINUM & GRAY IRON STRESS RELIEVING & AGING FURNACES

BOX

18"x36"x18" Heviduty 30KW 1850° F

36"x48"x24" Lindberg 45KW 1250° F
60"x120"x42" Lindberg 160KW 1250° F
66"x60"x57" Industrial gas 1250° F

CONTINUOUS SLAT CONVEYOR

70"x24'x25" Gehnrich Gas 200° F - 1000° F Like New - 2 available

18"x10'x4" Stewart Sunbeam Gas 1400° F Mesh Belt Type "Brand New".

OVENS — GAS & ELECTRIC

60"x48"x60" Coleman Gas 800° F Shelf type
60"x36"x30" Gehnrich 20KW 800° F Shelf type (2 avail.)
53"x108"x70" Mayer Gas 750° F Walk-in.

PIT TYPE ELECTRIC

20"x26" L&N 45KW 1400° F
22"x26" L&N 45KW 1200° F
28"x28" L&N 60KW 1400° F
40"x48" L&N 75KW 1400° F
22"x36" Lindberg 52KW 1250° F
28"x48" Lindberg 52KW 1250° F
48"x60" Lindberg 90KW 1250° F

PIT GAS

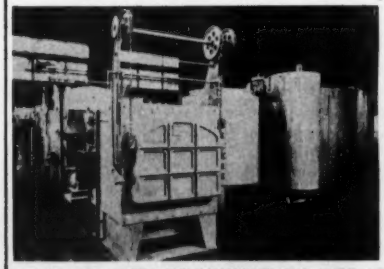
25x20 Lindberg 1250° F (9 available)
25x30 Lindberg 200° F - 1750° F
48x60 Lindberg 1250° F
48x72 Lindberg 200° F - 1750° F (2 available)

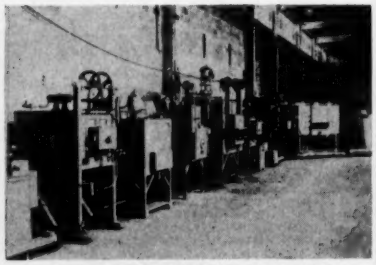
ALUMINUM & STEEL INDUCTION MELTING

6 - AJAX 35KW - hold 300# aluminum, 500# brass Melt 175# aluminum/hr., 210# brass/hr. Like New condition w/complete J.I.C. spec control panels.

1 - 20KW AJAX w/2 - 20# Furnaces. Complete w/controls & crucibles.

1 - 350KW ALLIS CHALMERS 960 cycle converter steel melting with 2 - 600# furnaces & controls.





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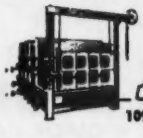

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DIVISION OF
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UNIVERSAL REBUILT EQUIPMENT GUARANTEED

AIR COMPRESSORS

1—75 hp INGERSOLL-RAND water cooled, horizontal
1—100 hp WORTHINGTON air cooled, 2 stage

AIR HOISTS

14—INGERSOLL-RAND ½ ton, 1 ton, and 2 ton.

BLOWERS

25—CENTRIFUGAL 16 oz., 2 to 5 HP
10—GE, WILBRAHAM - GREEN, FISHER Positive Pressure & Cent. Cupola Blowers

CLEANING EQUIPMENT & TUMBLING BARRELS

1—15" Cont. WHEELABRATOR Tumblast
1—26" Cont. WHEELABRATOR Tumblast
1—15" x 20" WHEELABRATOR Tumblast
1—20" x 27" WHEELABRATOR Tumblast
2—27" x 36" WHEELABRATOR Tumblast
1—36" x 42" WHEELABRATOR Tumblast
1—48" x 42" WHEELABRATOR Tumblast
1—48" x 48" WHEELABRATOR Tumblast
1—24" WHEELABRATOR Swing Table
1—1-A WHEELABRATOR Multi-table
1—PANGBORN TABLAST, 8' Table
1—PANGBORN Air Blast Room
1—PANGBORN Skewed Roll Cabinet
1—SLY, 68" x 32" Round
4—SLY 48" x 36" Round
1—WHEELABRATOR Peening Cabinet
1—48" WHEELABRATOR Swing Table

CONVEYORS

1—HEWITT-ROBINS Oscillating, 18" W x 40' L
1—HEWITT-ROBBINS Vibrating, 18" W x 10' L, Model VC-I
1—LINK-BELT Bucket Elevator, 8" x 12" buckets on 14" rubber belt, completely enclosed by 2' x 4" casing.
1—LINK-BELT, CAR type mold, 114 cars, 403' track, car size 18" x 42"
1—SIMPLICITY, 24" x 10" Feeder w/hopper, Model OA-10-JA2

CORE BLOWERS

1—CHAMPION CB-5, Bench Type
10—DEMMLER #1, #2, #2A, #3K, #4E
3—INTERNATIONAL 8B-13
3—OSBORN #91, #192, #91-10
1—RANDALL MODEL "A," Bench Type
1—TACCONE #4D, 10" Draw Stroke Cyl.

CUPOLAS

1—SKIP CHARGER for #9 Cupola with scale and buckets
1—WHITING Skip Charger for #5 Cupola
1—WHITING #4
1—WHITING #6

DUST COLLECTORS

COMPLETE STOCK—both Wet & Bag Type —send us your requirements

FURNACES—DIRECT ARC MELTING

1—250 lb. LECTROMELT, Side Charge
1—500 lb. LECTROMELT, 200 KVA trans.
1—1000 lb. SWINDELL
1—2000 lb. HEROULT
1—2000 lb. SWINDELL, 3/60 1000 KVA.
1—1½ Ton HEROULT
1—3 Ton LECTROMELT, Door Charge
1—3 Ton SWINDELL Hyd. Top Charge.
1—15 ton SWINDELL—3000 KVA Transformer. Latest type.

FURNACES—INDIRECT ARC

1—10# DETROIT
1—60# DETROIT
1—350# DETROIT LFA
1—750# DETROIT LPY, Conical Shell,
1—1000# DETROIT AAD P, 300 KVA
1—3000# Detroit C, 500 KVA

BEARDSLEY & PIPER
HYDRA-SLINGER
"Super Model"
Used only 40 hours
19" two speed head—5" tip
EXCEPTIONALLY LOW PRICE

FURNACES—INDUCTION MELTING

1—35 KVA AJAX 60 cy., alum.
1—35 KVA, AJAX SPARK GAP, High Freq., steel
1—1250 KW 2 Ton Cap.
1—5KW G.E. Tube Type Induction Heater
1—30 KW VACUUM Induction Melting Unit
1—30 KW LEPEL, water cooled spark gap

FURNACES—GAS & OIL

1—400# FISHER MNP, Gas Fired. Alum.
2—400# HAUSFELD hand tilt, Oil fired, alum or Magnesium
1—1 #900 JC STROMAN, gas. Like new
1—1200# Brass, MNP, Oil

FURNACES—HEAT TREAT

1—4' x 4' x 10' Gas Fired Annealing
1—9' x 12' Car Type, gas/oil
1—10" x 24" x 60" Gas, double end doors
1—12" x 36" x 8" high HAYES "Certain Curtain"
1—7' Rotary G.E., 200 KW, 1950° F
1—36" x 36" WESTINGHOUSE Pit Type.

MOLDING MACHINES

Jolt Rollover Pattern Draw

1—HERMAN 10,000#, 48" x 109" table
1—HERMAN 6000#, 42" x 78"
2—HERMAN 7500#, 40" x 50" tables
1—HERMAN 7500#, 40" x 60" table
1—HERMAN 3000#, 36" x 66" table
1—HERMAN 3000#, 32" x 70", 15" cyl. series charging conveyor type, turnover plate not jolted
5—HERMAN 1500# to 30" x 48" tables
3—HERMAN 750#, 24" x 30" tables
1—INTERNATIONAL 30" x 12", Type G, 28" x 35" table
2—INTERNATIONAL, 13" x 17" tables
1—OSBORN #442, 21" x 31" table, 600#
1—OSBORN #602, 36" x 26", 900#
1—OSBORN #405, 3000#, flask size 64" x 57", 26" draw
4—TABOR 40" x 60", 1500 & 3000# capacity
2—TABOR 30" x 40" w/air clamps, 1000#
1—TABOR 22" x 42" pattern draw, shockless, portable, 600#
1—TABOR 20" x 30", w/air clamps, 1000#
2—TABOR 14" x 16" Rockover 150#
1—TABOR 40" x 50" table, 3000# capacity

Plain Jolt

2—DAVENPORT, table 24" x 27", 1200#
1—INTERNATIONAL, 3' x 4' table, 12" cylinder

Jolt Pin Lift

1—HERMAN #4317, 22" x 30" table
2—INTERNATIONAL, JDP, 1200 x 8", 24" x 26" table, 8" draw, 1200#, port.
1—J & J #681-C, 30" x 25" table, 600#
1—OSBORN #559, 25" x 30" table, 6" draw, 1200#
2—8PO #305, 750 lb., 20" x 27" table
1—TABOR 20" x 24" table, 600#

Jolt Squeeze Pin Lift

2—INTERNATIONAL PKL, 20" x 28" table, 14" sq., 5¼" draw
2—INTERNATIONAL PKL, 18" x 24" table, 12" sq., 5¼" draw, stat.
1—MILWAUKEE #126, 21" x 27" table, 12" sq., 1200#, 8" draw
2—MILWAUKEE #163, 18" x 24" table, 11" sq., 1500#
1—MILWAUKEE #165, 24" x 30" table, 16" squeeze, 1700#
1—NICHOLLS 18-44, 6½" draw.
5—OSBORN #712J, #712PJ, 18" x 28" table, 12" sq., 6" draw, stat. & port.
5—8PO #2114P, 21" x 27" table, 600#
2—8PO #2116, 21" x 27" table, 11" sq., 6" draw

Jolt Squeezers

2—INTERNATIONAL #12 LJS, 16" x 20" table
4—INTERNATIONAL #10 LJS, 16" x 20"
10—OSBORN #270J, 16" x 20" table, 400# port.
12—8PO #110J, 17" x 20" table port.
3—TABOR Squeeze-in Head, 16" x 19" table

MATERIALS HANDLING

1—BYERS, Mobile Crane, BUDA Engine, 50' Boom, 5 ton w/magnet & bucket
1—HOUGH PAYLOADER, Model HA, 1000# cap hyd lift, mech. dump
1—SHAW BOX "Load Lifter" Electric Hoist, 5 ton capacity

MULLERS AND MIXERS

1—B&P #30 Speedmuller w/skip hoist, 3 cu. ft. batch
1—B&P #40 Speedmuller w/skip hoist, 5 cu. ft. batch
1—B&P #7 Mulbaro, 7 cu. ft. capacity
1—B&P #60 Speedmuller, 10 cu. ft. batch
1—B & P, Conventional, SIMPSON type, 87½" Dia. arranged for cooling
1—CLEARFIELD #404, 4' Dia, 4 cu ft batch
1—CLEARFIELD #610, 6' Dia., 10-14 cu ft. batch
1—SIMPSON #0, U.D. 3' Dia
1—SIMPSON #1, U.D., 4' dia., 4 cu. ft. batch
1—SIMPSON #2, 6' U.D. Dia, 14 cu ft batch
2—SIMPSON #3, enc. gear, 20-25 cu. ft. batch
1—SIMPSON #3, 8' Dia. Open Gear, 20-25 cu ft batch

LADLES

Bottom Pour

4—MODERN, 49" x 49"
2—MODERN Crane Type, 55" H x 50" top
1—MODERN Crane Type, 60" H x 60" top

Lip Pour

1—WHITING 40" x 40" top dia. geared

Cylindrical

8—WHITING, 26" L x 25" dia, 1100# iron
7—WHITING, 19" L x 22" dia, 600# iron
3—WHITING, 38" L x 28" dia, 2200# iron

OVENS

1—COLEMAN, Gas, 2 Comp. and 5 drawers, O.D. 22" x 12' x 10'
1—GENRICH, Elec., 3 drawer, preheating, auto-control, 9' H x 8' W x 6'7" L.
3—GENRICH, Elec. elevator type, Inspection under operation in N.Y.C.—Excellent Condition

SAND CONDITIONING

1—AMERICAN Sand Cutter, Model AA, 62" cutting reel
1—B & P Nite-Gang
2—B & P Screenarator, Model "S" & "M"
1—LINK-BELT Revivifier
1—MOULDER'S FRIEND, 50" cutting reel
2—ROYER, NC-2, 10-15 tons/hr, 1½ HP
1—ROYER NC-4, 10-15 tons/hr. 1½ Hp
1—ROYER PREPARATOR, Comb. Model NDC, 25 ton/hr scrap removal, 8' x 8' hopper
3—ROYERS, NDP, 15-25 tons/hr, 2 Hp
1—SIMPLICITY Type SOBG, 4' x 5' screen

SAND SLINGERS

1—B&P Stationary, 2 speed, 19" head, 4" tip with plate feeder
1—B&P Stationary, Single Speed
2—B&P Tractor Type 16" head
1—B & P Tractor Type, 19" head

TESTING EQUIPMENT

BRINNEL Hardness Testers, Manual & Motorized
1—10,000# BALDWIN-UNIVERSAL

MISCELLANEOUS

1—BLASTCRETE Model PM-1 Cupola Gun
1—200 KW, 230 volt D.C. MG Set
1—HOWE WEIGHTOGRAPH SCALE, Model 1700
1—KANE & ROACH WIRE STRAIGHTENER, Model DX-5
FLASKS, CORE PLATES, All Sizes
1—CLIMAX Model 2-A Wire Straightener
10 or 15 HP GRINDERS, Swing Frame
8—GRINDERS, Double End, Pedestal Type, U. S., Cin., Gardner, 5, 7½ & 10 HP

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Circle 878 on Page 53

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NEWAYGO

BELTING
29" x 180' 24" x 152'
24" x 263' 24" x 120'

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GE 10500 cfm., 20 oz., 85 hp., 220 V.
GE 7500 cfm., 20 oz., 89.6 hp., 220-440 V.
GE Centrifugal 6200 cfm., 24 oz., 58 hp. motor
SPENCER 7000 cfm 32 oz.
SPENCER 7350 cfm., 16 oz., 50 hp.
SPENCER 2250 cfm., 16 oz., 15 hp., 220 V.
SPENCER 1350 cfm 32 oz.
Ingersoll-Rand 12900 cfm, 100 h.p. 220-440V, 20 oz.
McKee 200 cfm
North American 850 cfm.
NORTH AMERICAN 1050 cfm., 16 oz.

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6—HAMMOND VROL 3 hp variable speed
HAMMOND 5-VRO 5 hp variable speed
STANDARD 20 RSB 20 h.p.

CLEANING EQUIPMENT
Model 4836V-B VAPOR BLAST

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17' BARBER GREEN Bucket Conveyor
30" x 25' Magnetic Belt Conveyor w/drives, 2 hp., 220-440 V.
SIMPLICITY 18" x 24'

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CB15 55# cores, Universal blow plate
DEMMLER #4 up to 250# cores
FEDERAL "SAN-BLO" CB 4C
INTERNATIONAL SB15H, up to 150# cores. Hydraulic clamp and draw
INTERNATIONAL SB 13, up to 60# cores
INTERNATIONAL SB12, Medium cores
6—OSBORN 193 up to 50# cores

CORE GRINDERS
5—MILWAUKEE 70-9 & 70-12s
1—OWOSSO DE1-303 42" table

CORE OVENS
THERMONIC INDUCTION MODEL 1800A
5—DESPATCH, Gas Fired, 3 Drawer

CORE ROLLOVERS
INTERNATIONAL REDP Rollover 12" draw

CRANES
P&H 3 TON Electric Traveling DC motors 50' span
270' Crane Runway and Supports
10 ton MILWAUKEE; 48' span, 220 V.

CUPOLA GUNS
1—BONDACTOR #1250
BONDACTOR #1000

DUST COLLECTORS
PARSONS 40,000 cfm. cloth bag type
ROTOCLONE, Size 6, Wet Type, 3000 cfm
ROTOCLONE W14 Arrang. A, 5200 cfm.

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1—DETROIT "LFA" 350# shell 13200 V.
1—DETROIT "LFC" 700# and 350# Tapered Shell 2300 V.
FLASK HOIST—ROLLER CONVEYOR

FURNACE TRANSFORMERS
1—"LECTROMELT" 800 KVA, 12000 V, 3 phase
PENNSYLVANIA 750 KVA, 13200 V., single phase
1—WESTINGHOUSE 500 KVA, 11200 V., 3 phase
1—WESTINGHOUSE 2500 KVA, 13800 V., 3 phase

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U. S. DOUBLE END SNAG, 20" x 3" Wheel, 15 h.p.
U.S. #70 Combination 20" disc and 20" x 3" x 1¼" wheel
GARDNER 18" single end disc.
HANCHETT 30" double spindle opposed
GARDNER 26" D.E. Disc.
GARDNER 30" D.E. Disc.
STANDARD 24" x 3" wheel Snag, 2-7½ h.p. motors

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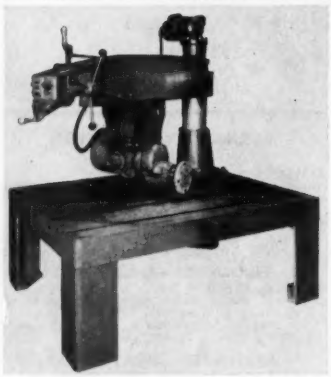
FOX 24" x 3" x 12", 15 h.p.
MARSCHKE 24" x 3" x 12" 20 hp., 220 V.
U.S. 24" x 3" x 12" 15 hp., 220-440 V.
2—MARSCHKE 3 hp., 12" wheel
1—B&D 7¼ hp.



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2—4000# Lo Hed, 220/440V
10 ton SHAW BOX electric hoist
4—INGERSOLL-RAND Air trolleys
1—500# INGERSOLL-RAND LC-4
4—CLEVELAND 2000# Cab type hot metal carriers

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100 KW-Ajax 300# 3000 cycle, 150 h.p. 4 bearings MS set, water cooled, complete controls
30 KW Lepel Spark Gap
35 KW Ajax Tama Wyatt, 60 cycle induction holding furnaces
1000# Ajax Spare Melting Furnaces—Unused

LADLE MIXING
4000# Industrial, Insulated

MOLD BLOWER
TACCONE TD4 24" x 32" flask

MOLDING MACHINES
JOLT SQUEEZE PIN LIFT
2—OSBORN 712 PJ 18" x 28" table
1—CHAMPION JSL10P 18" x 21" table 6" draw
8—MILWAUKEE 2646 Jolt Squeeze Strip rolloff — rolling molding machines 10" jolt cylinder; 1800# capacity, 26" Squeeze cylinder; 13" draw, Flask size 25½" to 29" wide, 52" long. FACTORY REBUILT.

JOLT SQUEEZERS
4—CHAMPION, JS10P 18" x 21" table
2—OSBORN 275PJ
2—MILWAUKEE 244 Jolt Squeeze car type head
MILWAUKEE 181-7, 24" x 36" table

JOLT ROLLOVER DRAWS
HERMAN 10000# late
HERMAN 3000#
2—750# HERMAN 20" x 30" table
1—INTERNATIONAL RJ 20" x 12"
3—SPO 9032

JOLT SQUEEZE ROLLOVER DRAW
2—#331 OSBORN 24" x 30" flask area, 7" draw

JOLT PIN LIFTS
MILWAUKEE 3000#, 38" x 42"
2—INTERNATIONAL 1200-8 26" x 27" table, 8" draw

PLAIN JOLT
40" x 84" Herman
36" x 60" Herman

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1—#60 B & P
1—#80A B & P
2—#3 UD Simpson
1—930 Clearfield
1—#1 Simpson Muller
B & P #30 w/skip multrol, also has cooling or heating coils for plastic or shell.

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AMERICAN 51"
JEFFREY SANDITIONER

SAND SLINGERS
1—B&P Tractor, 19" heads
MOTIVE JR., 19" 2 speed head

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30" LAIDLAW, Metal Cutting hydraulic feed
42" TANNEWITZ, 5 hp., 220-440 V.

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3' x 5' SIMPLICITY
5' x 6' SIMPLICITY
3' x 10' SIMPLICITY
7' x 8' SIMPLICITY SOM14

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SHELL PRODUCTS 20" x 30" pattern size w/shell blender and bonding press

SHOT BLAST
SLY #4, 20" x 30" w/dust collector

SLAG DISPOSAL UNIT
AMERICAN MODEL A

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STRAIGHTENING PRESS HYDRAULIC
150 ton HPM
150 ton Farquhar "C" Frame
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60 ton Farquhar "C" Frame

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60,000# BALDWIN SOUTHWARK Tensile Tester
COLEMAN 55 Spectrophotometer
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TINIUS OLSON Brinnel Hardness Tester Production
TINIUS OLSON Brinnel Hardness Tester Bench

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SLY, 30" x 60" Duplex.
WHITING 60" x 72" 20 hp. drive

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2—20" x 27" AMERICAN, w/rubber belt
1—42" x 48" AMERICAN Skip Loader.
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PANGBORN GD1-Airblast Barrel

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1—OLIVER 182D, 15" Disc Sanders
WALLACE 8" Jointer
CRESCENT 24" Planer
TANNEWITZ 42" Band Saw
ONSRUD W-244 & W-240 Routers
8", 12" and 30" Jointers
16", 32", 36" Band Saws

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B-21-Multiplex Wire Bender & Cutter

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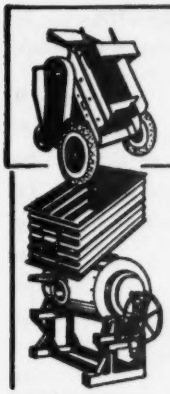

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2—8 Drawer, oil fired, auto control.

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1—Ajax—Tama Wyatt, 300 lbs. aluminum per hr., 60 KW, 100 KVA, 460v, 1 ph., 60 cy.
1—Heat-Treat, Lindberg, 72 x 84 x 96, car type, 105 KW, 220v, 3 ph., 1250°F.
1—350 lbs. Detroit Rocking

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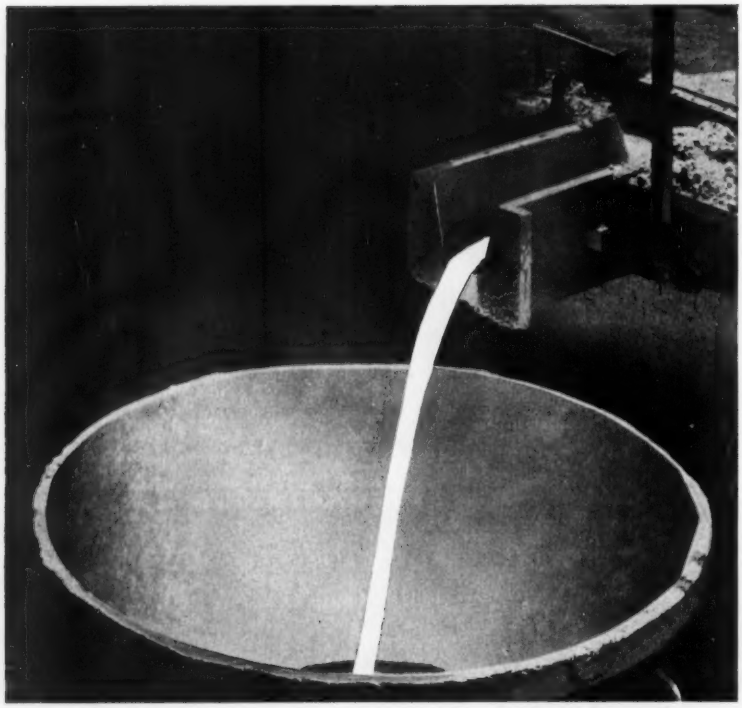

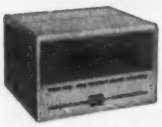

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Main 1-8260

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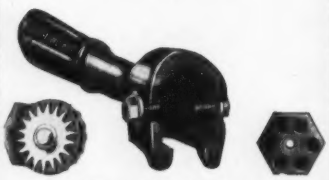
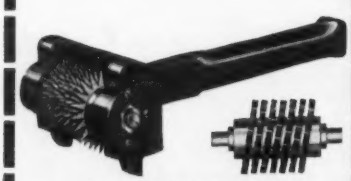


Desmond Hex Dresser

LIVES FOR FOUNDRY GRINDING WHEEL



Desmond Heavy Duty Dresser

DRESSERS

Cut grinding and snagging costs with inexpensive Desmond Hex dressers. They bring grinding wheel faces to "new" efficiency by removing loaded metal and exposing sharp abrasive grains. And Hex dressers provide **six** sets of bearings in one set of bearing blocks . . . for extra life on average wheels. For resinoid and rubber bonded high-speed wheels use the ball-bearing Desmond Heavy Duty Dresser. Ask your Desmond distributor's advice.

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exothermic anti-piping compounds for increased feeding efficiency

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FROM NEW ENGLAND TO TEXAS

and over the length and breadth of Canada, gray iron and ductile foundrymen are using SUPERFLUX in their cupolas, and LADLE FLUX in their alloying ladles and are getting "bang-up" results.

Let us widen your margin of profit by giving you better castings and smoother operations.

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TANNEWITZ BAND SAWS are Fast, Stand up under toughest usage!

Replacing your old band saws, used in cutting off gates and risers of ferrous and non-ferrous castings, with Tannewitz Band Saws is one of the best dividend-paying investments you can make. They cut many times faster, reduce down-time and repairs to almost nothing, pay for themselves in short order. Available in 24" to 52" wheel sizes with variable speeds from 60 to 15,000 FPM, or single speed to suit your particular production requirements as established by testing of your materials in our factory. Write or phone for details.

THE TANNEWITZ WORKS, INC.
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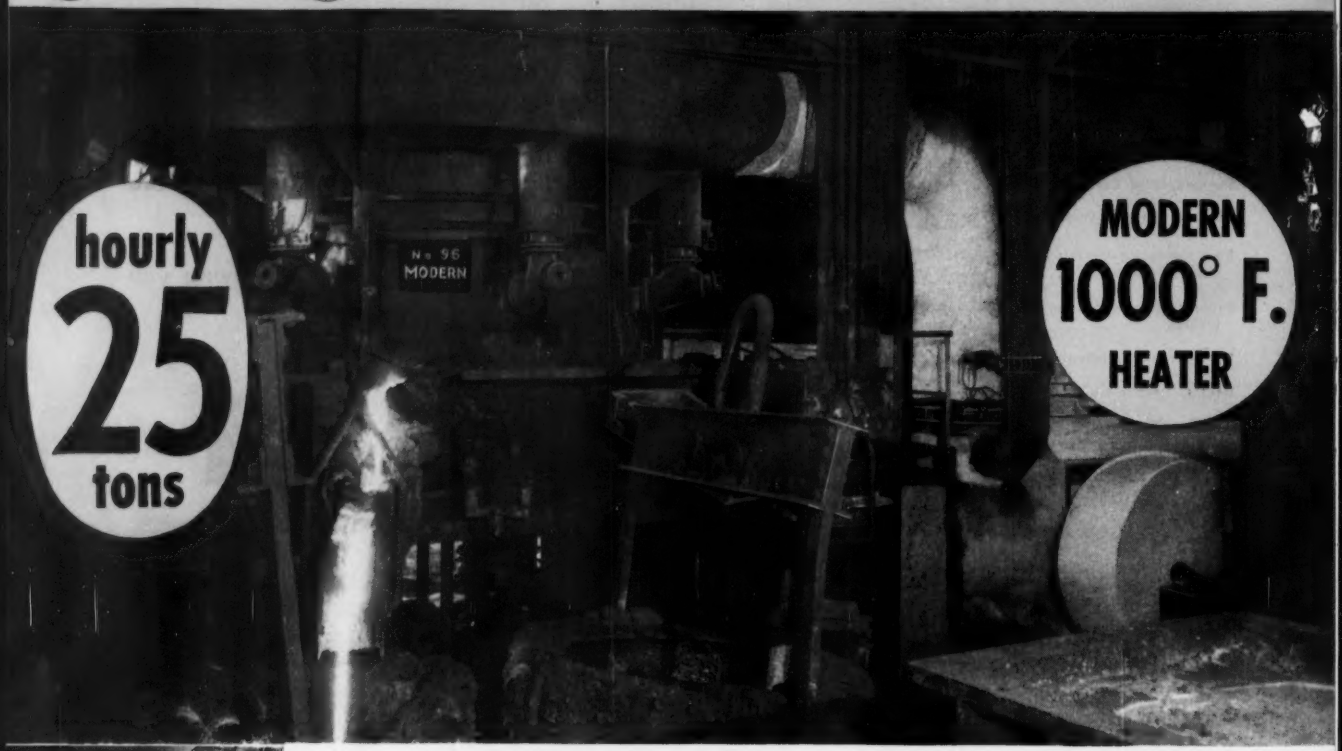
MODERN WATER-COOLED CUPOLA OPERATION . . .

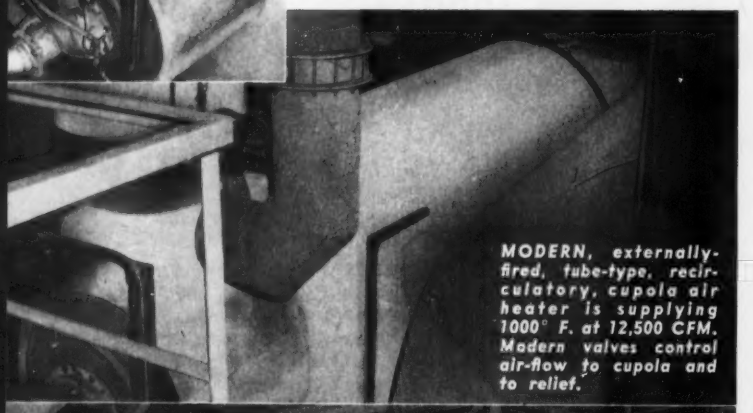


Modern, #96 W-C, water-cooled cupola is 96" dia. in the carbon-lined, off-set well. Cupola is fired by 1000° F. Modern heater. Melting progresses continuously; 5 days a week and 24 hours daily.

Nozzle-mix, gas burner of 22 million BTU capacity.

EFFICIENCY BOOSTED BY 1000° F. RECIRCULATORY HEATER . . .

Again, the nation's melting costs are boiling down! NOW, MODERN, economical and highly flexible water-cooled cupolas are fired by new, MODERN, recirculatory, hot-blast heaters:

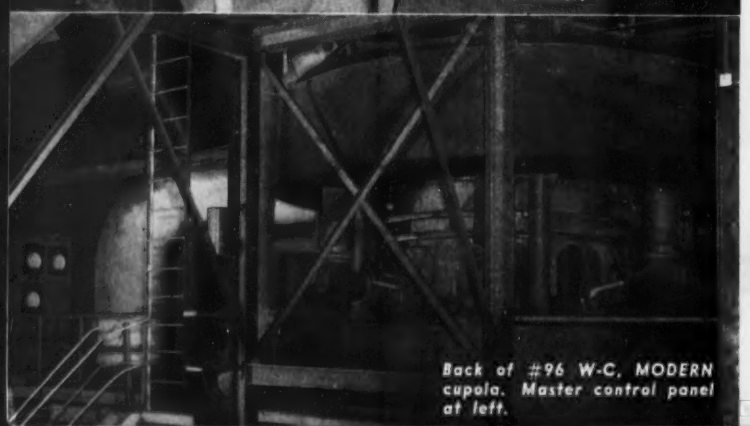


MODERN, externally-fired, tube-type, recirculatory, cupola air heater is supplying 1000° F. at 12,500 CFM. Modern valves control air-flow to cupola and to relief.

Blast air, to 1000° F. and in volumes to 12,500 CFM is helping to cut coke ratios while producing better metal, for ingot-molds, at Vulcan Mold & Iron Company, Lansing, Illinois. Among the major advantages, as gained at Vulcan are:

- Flexibility and fine control over melting processes . . .
- Prolonged periods of melting without dropping bottom . . .
- Decreased costs for coke, refractory and maintenance . . .

Melting, at Vulcan Mold & Iron Company, progresses continuously from Monday morning until Friday night. All these and other benefits are covered in new bulletin 149-A.



Back of #96 W-C, MODERN cupola. Master control panel at left.

MODERN

MODERN EQUIPMENT COMPANY
Port Washington, Wisconsin

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MAKE US PROVE IT!

Here are two of the finest core pastes ever to come out of the Stevens laboratories. One is mixed ready to use, the other is dry. Both do an excellent job and one or both are just what you should use in your foundry operations.

SUPER-KORFAST CORE PASTE

NEW FORMULA – water-mixes and *stays* smooth and creamy over a wide consistency range. No puddle-down . . . stands up to bridge spaces between core surfaces.

NEW ECONOMY – thinly compressed joints use less paste . . . provide more accurate dimensions . . . dries faster, minimizes gas, low water absorption.

HIGH TENSILE STRENGTH – no weakening when set in molds for long intervals. Pasted assemblies will hold fast even when dipped in core wash.

FASTICK LIQUID CORE PASTE

SPEEDS PRODUCTION – dries fast in air or oven. Comes ready to use . . . flows freely and smoothly . . . remains homogeneous in storage.

ECONOMICAL AND VERSATILE – only a light application is needed . . . is highly effective in pasting resin bonded cores and shell molds . . . no clamps needed.

UNIQUE QUALITIES – less gas volume than conventional core pastes . . . cannot ferment . . . impervious to moisture.

We would like to prove our claims. Let us make a trial run in your plant. Phone or write to:

frederic b. **STEVENS,** inc.

DETROIT 16, MICH.

BUFFALO CHICAGO DETROIT CLEVELAND
INDIANAPOLIS MILWAUKEE NEW HAVEN SPRINGFIELD (OHIO)

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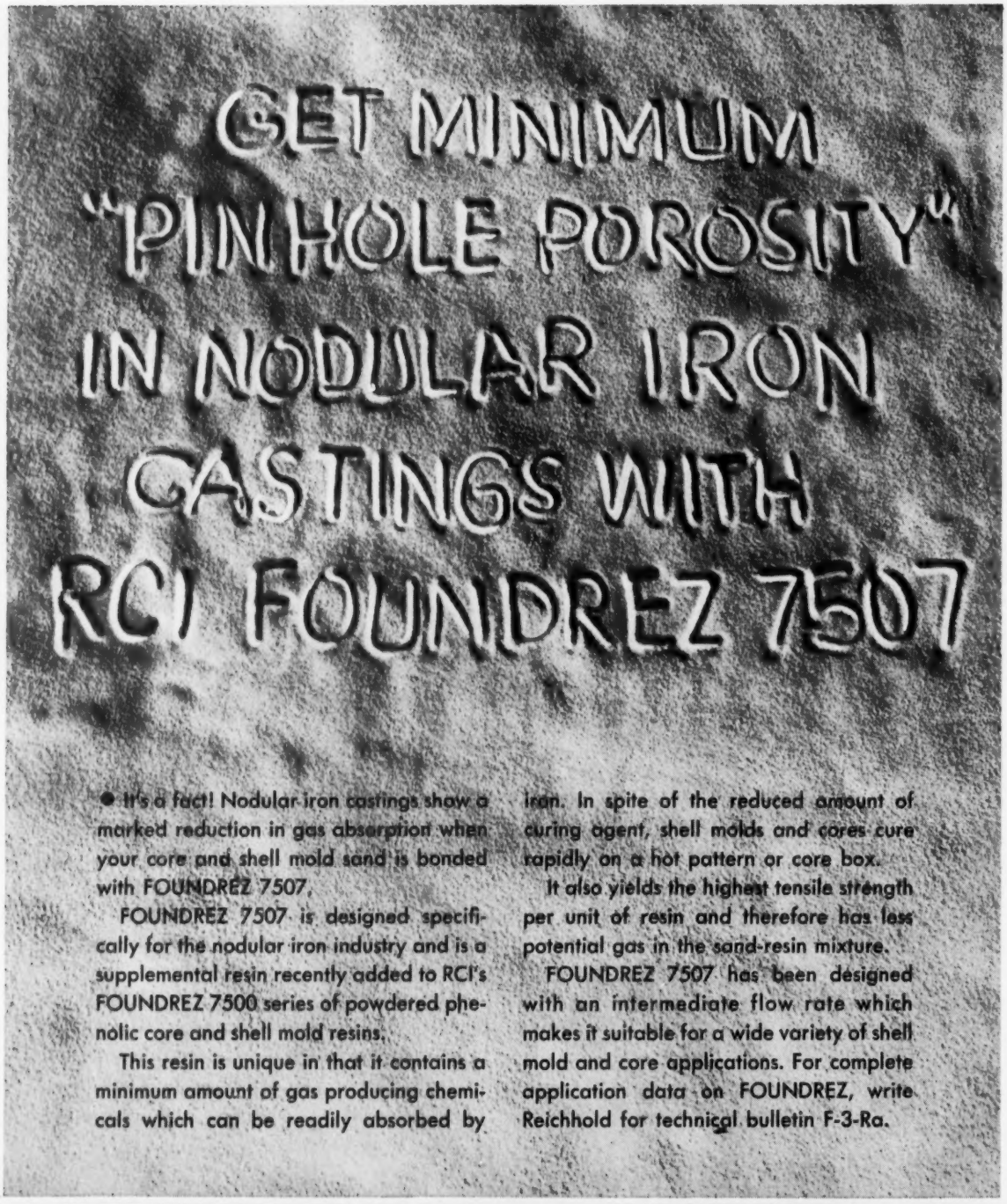
EVERYTHING FOR A FOUNDRY



● It's a fact! Nodular iron castings show a marked reduction in gas absorption when your core and shell mold sand is bonded with FOUNDREZ 7507.

FOUNDREZ 7507 is designed specifically for the nodular iron industry and is a supplemental resin recently added to RCI's FOUNDREZ 7500 series of powdered phenolic core and shell mold resins.

This resin is unique in that it contains a minimum amount of gas producing chemicals which can be readily absorbed by iron. In spite of the reduced amount of curing agent, shell molds and cores cure rapidly on a hot pattern or core box.

It also yields the highest tensile strength per unit of resin and therefore has less potential gas in the sand-resin mixture.

FOUNDREZ 7507 has been designed with an intermediate flow rate which makes it suitable for a wide variety of shell mold and core applications. For complete application data on FOUNDREZ, write Reichhold for technical bulletin F-3-Ra.

Creative Chemistry...
Your Partner in Progress

RCI

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COROVIT — Self-curing Binders • coRCIment — Core Oils

REICHHOLD CHEMICALS, INC., RCI BUILDING, WHITE PLAINS, N. Y.

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